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Energy Research Abstracts

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Office of Scientific and Technical Information
UNITED STATES DEPARTMENT OF ENERGY

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Energy Research Abstracts

Coverage

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports and patent applications originated by the U.S. Department of Energy, its laboratories, energy centers, and contractors, as well as theses and conference papers and proceedings issued by these organizations in report form. Audiovisual materials, computer media (magnetic tapes, diskettes, etc.), and engineering drawings are included in this definition. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations, *provided* that the full text of the document has been received by OSTI. Foreign report information is obtained through the International Energy Agency's 15-nation Energy Technology Data Exchange, the International Atomic Energy Agency's International Nuclear Information System, or nation-to-nation agreements. The purpose of this publication is to announce documents produced or obtained by DOE that are not so readily available as journal articles, books, or patents.

Scope

The scope of *ERA* encompasses DOE's research, development, demonstration, and technology programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

The citations presented in *ERA* are available for online searching as records within the Energy Science and Technology Database (EDB). The current-year records are available on the Integrated Technical Information System (ITIS).

Availability

DOE and DOE contractors who have OSTI deposit accounts can obtain *ERA* (regular issues and annual indexes) from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information, call (615)576-8401. *ERA* is also available at authorized GPO Depository Libraries. (List is provided on the inside back cover.)

ERA (regular issues and annual indexes) is available to the public on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Managing Editor, Doris M. Henline
Technical Editor, Milton O. Whitson

Information Sources

The citations presented in *Energy Research Abstracts* are a subset of the worldwide energy information provided to the Office of Scientific and Technical Information (OSTI) through exchange agreements with foreign sources and through exchanges or contracts with U.S. organizations.

The **Energy Technology Data Exchange (ETDE)** was established by the International Energy Agency to promote cooperation among members in conducting appropriate energy-related research and development programs through the development of a formal central information sharing system. In accomplishing the objectives of the ETDE, members select, abstract, and index relevant research information published in their countries in accordance with Exchange standards. OSTI serves as the central receiving and processing center for this information, which it then disseminates to national centers in the participating countries. The following countries are currently members of the ETDE:

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- Finland
- France
- Germany
- Italy
- Japan
- Korea
- The Netherlands
- Norway
- Spain
- Sweden
- Switzerland
- United Kingdom
- United States

The **International Nuclear Information System (INIS)** was established to promote the exchange of information on nuclear science and technology. Its operation is similar to that of the ETDE, with the INIS Secretariat being located in Vienna, Austria. Currently, 79 countries and 15 international organizations are members of INIS. OSTI serves as the INIS national center for the United States.

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The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
5. **Author affiliation.** Only first one is listed, in parentheses after author(s) to which it applies.
6. **Collaboration,** if present.
7. **Corporate author(s)** identifying corporation responsible for document.
8. **Date of publication.** If not known, a processing date is in brackets.
9. **Number of pages** or page range. Prices are based on total pages unless special pricing applies.
10. **Language** of document if non-English.
11. **Monograph title** if citation is an analytic (part, chapter, or paper) of a larger monograph.
12. **Sponsoring organization.**
13. **Contract or grant number.**
14. **Secondary identifying number;** may be a conference number.
15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18194 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in $30m^2$ air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Order from the Availability Sources

TO OBTAIN A REPORT

Report literature, usually identified by an alphanumeric identifier at the beginning of a citation, is available from the sources listed in the citation (see example of element 2 on page iii). Often the sources are listed as abbreviations. Corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given, **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) OSTI prices are based on total pages unless special pricing applies. The public should order from NTIS or from one of the other agencies listed in the citation. NTIS price codes may continue to appear in some records. To expedite processing, an order form is provided in the back of this publication. NOTE: The order numbers provide quicker access for report ordering. Use the order number where possible.

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Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at Government Printing Office regional depository libraries.

INIS *Available only in microfiche.*
INIS Clearinghouse
International Atomic Energy Agency
P.O. Box 100, A-1400
Vienna, Austria

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

How To Use the Indexes

Five indexes are provided for approaching the content of each issue of *Energy Research Abstracts*. Descriptions of entries in these indexes follow.

Corporate Author Index
The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index
Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index
This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index
DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index
Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is:

DOE/ER/40438–T1 15:18494 NTIS, OSTI E 1.99: DE89007246 MF-411

Subject Contents

The subject content of *Energy Research Abstracts* is arranged as shown below. The two-digit and four-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level and the 313 second-level categories. Because each issue of *ERA* publishes citations only for those documents announced during the past semimonthly period, some subject categories may not be present in every issue.

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*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope*.

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Energy Research Abstracts

01 COAL, LIGNITE, AND PEAT

0103 Preparation

Refer also to citation(s) 22

1 (IS-M–760) **Applications of coal-mineral association determined by SEM-AIA to physical coal cleaning.** Straszheim, W.E. Ames Lab., IA (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94000667. Source: OSTI; NTIS; GPO Dep.

Analysis of the association of minerals with coal using scanning electron microscope-based automated image analysis (SEM-AIA) is described and applied to physical coal cleaning. Results are expressed with regard to both density-based and surface-based cleaning processes. Samples of nominal 200-mesh Pittsburgh No. 8 coal used in column flotation experiments were analyzed by SEM-AIA to predict cleanability for both types of cleaning and for individual minerals. Results indicated good liberation of minerals based on particle mineral matter content and thus predicted good cleanability by density-based methods. Results also showed poor liberation of pyrite compared to other minerals when particles were categorized according to surface appearance, thus indicating poor cleanability. Predictions were generally borne out by actual separations although additional factors besides liberation appear to be hindering the cleanability of pyrite by column flotation.

0104 Processing

Refer also to citation(s) 48, 49, 57, 67, 649, 652, 665, 863, 1118, 1160, 1246, 1892

2 (AAA-KTF/FKF–91/14) **Nitrogen chemistry at gasification: A thermodynamic analysis.** Kilpinen, P.; Hupa, M.; Leppaelahti, J. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 51p. Order Number DE94709686. Source: OSTI; NTIS.

LIEKKI Research Programme.

The report deals with the C-H-O-N-S chemistry at peat and coal gasification. The equilibrium concentrations of gasification products were determined at different temperatures, air-fuel stoichiometries and pressures by means of global thermodynamic analysis. Special emphasis was placed on the nitrogen compounds. The equilibrium concentrations for N and major C-H-O species were compared with experimental peat gasification data obtained from a laboratory scale fluidized bed under atmospheric pressure. Calculations show that ammonia and hydrogen cyanide are the major fixed-nitrogen species under most temperature and air-fuel stoichiometry conditions from thermodynamic point of view. For air-fuel stoichiometric ratio 0.0 to 1.0 and the temperature 500-1000 deg C, the equilibrium concentration of the total-fixed-nitrogen (TFN = NH_3 + HCN) is generally low, below 100 ppm_v. At very fuel-rich conditions ($SR<SR_{crit}$), however, the concentration of TFN strongly increases as a function of temperature if the temperature is higher than 1000 deg C. This is a result of an increase in the HCN concentration. The SR_{crit} value depends on the fuels degree of oxidation and C/N molar ratio. Compared to experimental data the concentrations of HCN and NH_3 measured are more than hundred times higher than corresponding equilibrium concentrations. The same is true for methane. A significant fraction of carbon is found in ash in the experiments, whereas all carbon exists in the gas-phase according to the equilibrium. For CO, CO_2, H_2, and H_2O the equilibrium seems to be established if the actual stoichiometry the compounds feel in the experiments is taken into account in the calculations.

3 (AAA-KTF/FKF–91/16) **Sulfur chemistry under gasifying and combustion conditions: A thermodynamic analysis.** Yrjas, P.; Iisa, K. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 40p. Order Number DE94709687. Source: OSTI; NTIS.

LIEKKI Research Programme.

The sulfur equilibrium concentration in the presence of limestone under both combusting and gasifying conditions using a global equilibrium system has been studied. The sulfur capture with limestone or dolomite, when gasifying or burning coal and peat, was studied with thermodynamic analysis. The analyses were done by changing the air excess, temperature and pressure for four different fuels - Illinois 6, Polish coal, dry peat and wet peat (40 Wt-% H_2O).

4 (AAA-KTF/FKF–92/2) **Gas-phase conversion of NH_3 to N_2 in gasification product gases: A kinetic modeling study.** Kilpinen, P.; Leppaelahti, J. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 55p. Order Number DE94709699. Source: OSTI; NTIS.

LIEKKI Research Programme.

The possibility to convert NH_3 to N_2 by adding small amounts of O_2 and/or NO (0-5 vol-%) to hot air gasification product gases of peat was studied by means of gas-phase kinetic modeling. A reaction scheme comprising about 250 elementary reactions between 49 species was applied to isothermal premixed plug flow conditions under atmospheric pressure, and the influences of gas composition (NH_3, CO, CO_2, H_2, H_2O, CH_4, N2), temperature (700-1200 deg C), and time (0-5 s), on the NH_3 conversion reactions were investigated. Reaction rate analysis and sensitivity analysis were used to identify the main reaction paths and to discuss the uncertainties in the calculations. Significant N_2 yields were obtained by introducing O_2 or NO to a gas mixture of CO, CO_2, H_2, H_2O, and N_2, containing 5000 ppm_v NH_3. The N_2 yield was sensitive to the temperature and increased with increasing temperature. At temperatures above 1000 deg C, higher than 90 % total NH_3 reduction percentages were reached. The total NH_3 reduction percentage is here defined as $(1 - TFN/NH_{3,in}) \times 100$ %, where TFN is the amount of total fixed nitrogen, and $NH_{3,in}$ is the amount of inlet ammonia. At addition of O_2, the reduction of TFN was rapid. Most of the reduction occurred typically in less than 10 ms. At addition of NO, the reduction of TFN was characterized by a reaction time exceeding 1 s. The presence of small amounts of CH_4 (0.5-5 vol-%) reduced the total NH_3 reduction percentage drastically for the addition of both O_2 and NO. At the addition of NO, however, reduction percentages of about 50 % were still obtainable under a residence time of 5 s. When O_2 and NO were added simultaneously no significant improvement in the TFN reduction was observed, as compared to the addition of O_2 or NO alone.

5 (AAA-KTF/FKF–92/8) **Capture of hydrogen sulfide on limestone and dolomite under pressurised gasification conditions.** Iisa, K.; Yrjas, P.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 22p. Order Number DE94709693. Source: OSTI; NTIS.

LIEKKI Research Programme.

The literature concerning the capture of hydrogen sulfide in the presence of calcined limestone or dolomite has been studied in this report, which is a part of the project 'Reaction of Sulphur and Nitrogen Compounds under Pressurized Combustion and Gasification Conditions'.

6 (ANL/CHM/CP–79226) **Organic desulfurization of Illinois No. 6 coal.** Stock, L.M.; Chatterjee, K. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931014–1: 5. international conference on processing and utilization of high sulfur coals, Lexington, KY (United States), 24-28 Oct 1993). Order Number DE93041176. Source: OSTI; NTIS; GPO Dep.

First, lithium aluminum hydride cleanly removes pyrite from the Illinois No. 6 coal to leave the original organosulfur compounds. Second, the SET reagent selectively removes sulfur from heterocyclic sulfur compounds and aromatic sulfides. Lochmann's base

does not remove the sulfur from the heterocycles, but does react with sulfidic sulfur compounds such as alkyl aromatic sulfides that are susceptible to base catalyzed elimination reactions. Third, the organic sulfur compounds that remain after the dual SET and BASE treatment are dominantly aliphatic substances including alkyl and allylic thiols and fourth the sulfur compounds that remain are susceptible to thermal decomposition and acid hydrolysis.

7 (BNL–49390) **Development of non-petroleum feedstocks: The role of catalysis.** Mahajan, D. Brookhaven National Lab., Upton, NY (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931227–1: Winter school-cum-workshop on organometallic chemistry, New Delhi (India), 6-8 Dec 1993). Order Number DE93041151. Source: OSTI; NTIS; GPO Dep.

The utilization of natural gas and coal feedstocks was initiated in the 1970s' in response to volatility in availability and price of petroleum. This concerted effort led to the development of processes based on C_1, chemistry (2) through which synthesis gas (a mixture of CO and H_2) could be catalytically converted to hydrocarbons and oxygenates. The catalytic conversion to hydrocarbons via the Fischer-Tropsch (F-T) reaction continues to be of commercial interest (1) but further improvements in reaction rates and product selectivity are sought. To this effect, recently a liquid phase Fe (slurry) F-T catalyst has replaced the traditional solid Fe. For oxygenates synthesis the utilization of organometallic complexes is established. Examples include homogeneously catalyzed commercial synthesis of acetic acid (Monsanto process) and acetic anhydride (Eastman Kodak process) catalyzed presumably by $Rh(CO)_2I_2^-$ species at ~180°C and °50 atm. These examples indicate that organometallic complexes will find increasing applications as catalysts in new and improved processes. Since economical processes for direct conversions of coal (direct liquefaction) and natural gas (direct methane conversion) are yet to be targeted for commercial applications, synthesis of oxygenates via the "Indirect Route," i.e. through synthesis gas, is carried out. The stoichiometry of synthesis gas produced from these two sources is of interest. Thus, the H_2/CO ratio varies from < 1 for coal-derived syngas to 3 for syngas from steam-reforming of natural gas. In order to maximize C utilization, the Catalyst-By-Design (CBD) approach for synthesis of methanol and higher oxygenates is ongoing under the "BNL Catalyst Development" program.

8 (CONF-9306148–40) **On-line monitoring of mercury and hydrogen chloride in hot gases from coal gasifiers.** Norton, G.A.; Chriswell, C.D.; Eckels, D.E.; Buttermore, W.H. Ames Lab., IA (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. From Coal-fired power systems '93: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 28-30 Jun 1993. Order Number DE93000291. Source: OSTI; NTIS; GPO Dep.

A variety of analytical techniques which may be applicable to monitoring Hg or HCl in METC gasifier streams were identified. Potential approaches for on-line analysis of Hg and HCl are discussed in detail.

9 (DOE/ER/80998–93/C0217) **High temperature hydrogen sulfide removal with tin oxide.** Karpuk, M.E.; Copeland, R.J.; Feinberg, D.; Wickham, D.; Windecker, B.; Yu, J. TDA Research, Inc., Wheat Ridge, CO (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-90ER80998. (CONF-9306148–28: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019956. Source: OSTI; NTIS; GPO Dep.

The system is based on the absorption of hydrogen sulfide (H_2S) by stannic (tin) oxide. Two sorbents are required, the first sorbent is tin oxide and the second sorbent is a zinc oxide based material (i.e., zinc ferrite or zinc titanate) which is regenerated by air producing SO_2. TDA's process carries out a modified Claus reaction to reduce the SO_2 from the second sorbent generation to elemental sulfur. In this case the sulfided stannic oxide forms stannous sulfide (SnS) which reduces the SO_2. The absorption by SnO_2 could remove over 90% of the H_2S from typical coal gas streams, but we use zinc ferrite (or zinc titanate), (a) to reduce H_2S to less than 20 ppM and (b) as a source of SO_2 in regeneration. Due to stoichiometry of regeneration we want to remove half of the H_2S by SnO_2 and the remainder by the second sorbent. The reactions with stannic oxide minimize the heat released during H_2S removal and regeneration. The absorption by SnO_2 is slightly endothermic and cools the gas stream by less that 5°F (2.8°C) during absorption. Regeneration with SO_2 is exothermic but releases only 11% of the heat that is liberated in regenerating the ZnO. For a nominal 6.5:1 steam to air the regeneration of ZnO increases the temperature by ≃400°F. The regeneration of SnO_2 increases the temperature by less than 50°F (28°C) in the same gas flow.

10 (DOE/MC/25003–93/C0218) **Testing of zinc titanate desulfurization sorbents for moving-bed applications.** Ayala, R.E. (General Electric Co., Schenectady, NY (United States). Corporate Research and Development Dept.); Gal, E.; Gupta, R.P. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Dept. [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC25003. (CONF-9306148–34: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019862. Source: OSTI; NTIS; GPO Dep.

Sorbents developed for moving-bed systems must comply with a minimum of chemical and mechanical durability performance characteristics in order to be considered acceptable for long-term operation. Among the desired properties, a sorbent must have: (1) High chemical reactivity, as measured by the rate of sulfur absorption and the total sulfur loading on the sorbent. (2) High mechanical strength, as measured by the pellet crush strength and the attrition resistance; (3) Suitable pellet morphology, as given by pellet size and shape to promote good bulk flow ability and seasonable porosity to increase reactivity. Formulation 2A1.7M (UCI designation L-3787M) was selected by DOE as the baseline formulation for performance evaluation of Option 3 sorbents. This baseline formulation is a rounded zinc titanate sorbent containing a 2:1 Zn:Ti molar ratio, 1.7% molybdenum (equivalent to 2.5% MoO_3), and 3% bentonite binder that had been previously tested under the Option 2 program. Zinc titanate sorbents were prepared by UCI as rounded spherical or ellipsoidal pellets. The fabrication procedure is targeted at achieving a balance of mechanical strength (crush strength and attrition resistance) and chemical reactivity by controlling the pellet internal porosity.

11 (DOE/MC/25140–93/C0225) **Power Systems Development Facility, PFBC system perspectives.** Griswold, G.H. (Southern Co. Services, Inc., Birmingham, AL (United States)); Boyd, T.J.; Fankhanel, M.O.; Crumm, C.J.; Pontius, D.H. Southern Co. Services, Inc., Birmingham, AL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC25140. (CONF-9306148–44: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040920. Source: OSTI; NTIS; GPO Dep.

Southern Company Services (SCS) has investigated the feasibility of constructing a Power Systems Development Facility (PSDF) at the Southern Company's Clean Coal Research Center in Wilsonville, Alabama. The PSDF combines a number of pilot-scale test facilities at a single site to reduce the overall capital and operating cost compared to individual stand-alone facilities, while continuing the DOE/METC's objective of carrying out meaningful systems and component testing for advanced coal-based power generation development. The intent of the PSDF is to provide a flexible test facility that can be used to develop advanced power system components and assess the integration and control issues of these advanced power systems. The facility would provide a resource for rigorous, long-term testing and performance assessment of hot stream cleanup devices in an integrated environment, permitting evaluation of not only the cleanup devices but also other components in an integrated operation.

12 (DOE/MC/26367–3461) **Production of low-cost hydrogen: [Twelfth quarterly technical progress report, July 1, 1992–September 27, 1992].** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC21-89MC26367. Order Number DE94001313. Source: OSTI; NTIS; GPO Dep.

This twelfth quarterly technical progress report presents the results of work accomplished during the period July 1, 1992 through September 27, 1992 under Contract No. DE-AC21-88MC26367 entitled "Production of Low-Cost Hydrogen". The overall objective of this program is to verify the ability of the MTCI indirectly heated fluid-bed gasifier to produce a hydrogen-rich product gas from liquefaction by-product streams and from char produced in mild gasification processes. The two-tube gasification unit was modified to reduce heat losses through the reactor vessel. An 18-inch shell was refractory-lined to replace the 8-inch shell previously used. Two tests using a mild gasification char feedstock were conducted successfully. The reactor remained stable over the entire test period and the long-term tests provided similar product gas yields to the shorter term tests run earlier in the program. The SRC residue tests were deferred to the next quarter to provide time to resolve the feeding problems. The preliminary tests for bituminous coal devolatilization utilizing a simple preoxidation step utilizing flue gas for preheating was determined to be the most reasonable. The tests confirmed that there is a sufficient amount of sensible heat in the combustor flue gas to pretreat the caking coal so that the Free Swelling Index could be substantially reduced and thereby prevent agglomeration in the gasifier bed.

13 (DOE/MC/26367–3463) **[Production of low-cost hydrogen]: Technical progress report, October 1992–December 1992.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26367. (MTCI–10039-13). Order Number DE94001314. Source: OSTI; NTIS; GPO Dep.

The overall objective of the proposed effort is to verify, at the laboratory scale, the ability of the MTCI indirectly heated fluid-bed gasifier to economically produce a hydrogen-rich product gas from liquefaction byproduct streams and from char produced in mild gasification processes. An important objective of the proposed effort is to provide a process data base that can be utilized by the AMOCO Corporation in evaluating the design and economics of an integrated liquefaction process which employs the MTCI gasifier for hydrogen production. The AMOCO Corporation has offered to provide this effort at no cost to MTCI or the government. Their participation in the project is an important element in verifying the economics of an indirectly heated gasifier to meet the overall program objective of reducing the cost of direct liquefaction processes. During this period, gasification tests on SRC residue were completed and testing of a preoxidized caking coal was initiated. The oxidation process substantially reduced the free-swelling index (FSI) and by recycling the carbon to the gasifier, the efficiency of the process was also increased. All of the planned testing has been completed and the system analysis initiated.

14 (DOE/MC/26372–93/C0202) **Hollow fiber catalytic membranes.** Ma, Yi Hua; Moser, W.; Shelekhin, A.; Pien, Shyhing. Worcester Polytechnic Inst., MA (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26372. (CONF-9306148–25: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019870. Source: OSTI; NTIS; GPO Dep.

The objective of the present research is to investigate the possibility of the enhancement of the H_2S thermal decomposition in the IGCC system by employing the hollow fiber catalytic membrane reactor. To accomplish the objective, the following major components in the analysis of the high temperature membrane reactor must be investigated: high-temperature stability of the porous glass membrane; catalytic properties of MoS_2 and of the porous glass membrane; catalytic decomposition of H_2S in a packed bed reactor; catalytic decomposition of 100%, 8.6%, and 1.1% H_2S gas mixtures in the membrane reactor. The study has been shown that the conversion of the H_2S can be increased in the packed bed membrane reactor compared to the equilibrium conversion on the shell side. The development of a mathematical model for the proposed process is in progress. The model will enable optimization of the H_2S decomposition. These conditions include selectivity factors and pressure drop across the membrane.

15 (DOE/MC/27233–93/C0209) **LASH oxidation, waste management.** Shires, P.J.; Katta, S.; Henningsen, G. Kellogg (M.W.) Co., Houston, TX (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-91MC27233. (CONF-9306148–17: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019863. Source: OSTI; NTIS; GPO Dep.

Temperature for highest sulfation of both as-received KRW LASH and FW LASH was found to be 1700°F in the temperature range of 1500 to 1700°F studied. No significant amount of SO_2 was measured by gas analysis in the tests reported here. Confirmation of SO_2 release by sulfur balance including the solids is in progress. The sulfide conversion achieved for HSCF KRW LASH including the conversion obtained in the muffle furnace was about 80%. Grinding it did not enhance the conversion. By grinding and then doping it with an alkali, the conversion was increased to about 95%. The impregnation of CFHS FW LASH with the alkali enhanced the sulfide conversion to a high level (94%) just as observed for HSCF KRW LASH. The absorption of H_2S by the KRW LASH is as good as that observed for the two pure limestones used in this study. The absorption of SO_2 by the KRW LASH is poor compared to that of the pure limestones. Additional experiments are planned to attempt to identify the mechanism.

16 (DOE/MC/27391–3479) **Scale-up of mild gasification to a process development unit: Progress report, November 21, 1992–February 20, 1993.** Campbell, J.A.L.; Carty, R.H.; Saladin, N.; Foster, H. Kerr-McGee Coal Corp., Oklahoma City, OK (United States). Mar 1993. 12p. Sponsored by USDOE, Washington, DC (United States); Illinois State Government, Springfield, IL (United States). DOE Contract FC21-92MC27391. Agreement AE61. Order Number DE94001734. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to develop the IGT Mild-Gasification (MILDGAS) process for near-term commercialization. The specific objectives of the program are to: design, construct, and operate a 24-tons/day adiabatic process development unit (PDU) to obtain process performance data suitable for further design scaleup obtain large batches of coal-derived co-products for industrial evaluation prepare a detailed design of a demonstration unit develop technical and economic plans for commercialization of the MILDGAS process. The MILDGAS process is a continuous closed system for producing liquid and solid (char) co-products at mild operating conditions up to 50 psig and 1300°F. It is capable of processing a wide range of both eastern caking and western noncaking coals. The 1 ton/hr PDU facility that is to be constructed is comprised of a 2.5-ft ID adiabatic gasifier for the production of gases, coal liquids, and char; a thermal cracker for upgrading of the coal liquids; a three-stage condensation train to condense and store the liquid products; and coal feeding and char handling equipment. The facility will also incorporate support equipment for environmentally acceptable disposal of process waste.

17 (DOE/MC/29246–93/C0219) **Hot coal gas desulfurization with manganese-based sorbents.** Lynch, D.; Hepworth, M.T. Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering. [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29246. (CONF-9306148–32: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019896. Source: OSTI; NTIS; GPO Dep.

The focus of work being performed on Hot Coal Gas Desulfurization is primarily in the use of zinc ferrite and zinc titanate sorbents; however, prior studies at the US Steel Fundamental Research Laboratories in Monroeville, PA, by E.T. Turkdogan indicated that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt % ore + 25 wt % Al_2/O_3) may be a viable alternative to zinc-based sorbents. Manganese, for example, has a lower vapor pressure in the elemental state than zinc hence it is not as likely to undergo depletion from the sorbent surface upon loading and regeneration cycles. Also manganese oxide is less readily reduced to the elemental state than iron hence the range of

reduction potentials for oxygen is somewhat greater than for zinc ferrite. In addition, thermodynamic analysis of the manganese-oxygen-sulfur system shows it to be less amenable to sulfation than zinc ferrite. Potential also exists for utilization of manganese higher temperatures than zinc ferrite or zinc titanate. This presentation gives the thermodynamic background for consideration of manganese-based sorbents as an alternative to zinc ferrite. To date the work which has been in progress for nine months is limited at this stage to thermogravimetric testing of four formulations of manganese-alumina sorbents to determine the optimum conditions of pelletization and induration to produce reactive pellets.

18 (DOE/MC/29246–3460) **Hot Coal Gas Desulfurization with manganese-based sorbents: Second [quarterly] technical report, December 1, 1992–March 1, 1993.** Hepworth, M.T. Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering. 1 Mar 1993. 36p. Sponsored by USDOE, Washington. DC (United States). DOE Contract AC21-92MC29246. Order Number DE94001315. Source: OSTI; NTIS; GPO Dep.

At present, the focus of work being performed on Hot Coal Gas Desulfurization is primarily in the use of zinc ferrite and zinc titanate sorbents; however studies at the US Steel Fundamental Research Laboratories in Monroeville, PA, by E. T. Turkdogan indicate that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt % ore + 25 wt % Al_2O_3) may be a preferable alternative to zinc-based sorbents. A significant domestic source of manganese in Minnesota is being explored for an in situ leach process which has potential for producing large tonnages of solutions which may be ideal for precipitation and recovery of pure manganese as a carbonate in a reactive form. In the current program the following studies will be addressed: Preparation of manganese sorbent pellets and characterization tests on pellets for strength and surface area; analysis of the thermodynamics and kinetics of sulfur removal from hot fuel gases by individual sorbent pellets (loading tests) by thermogravimetric testing; regeneration tests via TGA on individual sorbent pellets by oxidation; and bench-scale testing on sorbent beds in a two-inch diameter reactor. The developed information will be of value to METC in its determination of whether or not a manganese-based regenerable sorbent holds real promise for sulfur cleanup of hot fuel gases. This information is necessary prior to pilot-scale testing leading to commercial development is undertaken.

19 (DOE/METC/C–93/7095) **METC Fluid-bed Test Rigs/Test Program.** Walczak, S.C. (USDOE Morgantown Energy Technology Center, WV (United States)); Rockey, J.M.; Rutten, J. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). (CONF-9306148–11: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019740. Source: OSTI; NTIS; GPO Dep.

Since its last runs in December 1989, the 6-inch gasifier has been modified to enlarge the reactor inside diameter to 10 inches. Recent runs have shown stable operation and increased carbon conversion with the new gasifier size. As a 10-inch reactor, the METC FBG has logged over 150 hours online with Montana Rosebud coal. Table 2 shows typical solids analyses for an April 1993 run. A series of hot gas desulfurization tests using a batch-mode, fluidized bed to contact the coal gas with sulfur capturing sorbent marked the last integrated runs with the 6-inch, fluid-bed gasifier [2]. Table 3 shows typical coal gas composition before and after the fluid-bed, hot gas desulfurization reactor. Shakedown tests of the MGCR were performed in April and May 1993. These tests were performed primarily to obtain the characteristics of a candle filter created by the Shell Development Company as part of a Cooperative Research and Development Agreement (CRADA). The April run was a 4-day test using a 30-lb batch of zinc ferrite desulfurization sorbent. A plot of the sulfur removal in this run compared with one in 1989 [3] is shown in Figure 5. It is obvious from this figure that the MGCR has performed consistently despite a 4-year hiatus.

20 (DOE/METC/C–93/7096) **Fluid-bed HGD PDU.** Bissett, L.A. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). (CONF-9306148–12: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019739. Source: OSTI; NTIS; GPO Dep.

METC is constructing an on-site, fluid-bed, hot-gas desulfurization (HGD) process development unit (PDU) to support the US Department of Energy's (DOE) Integrated Gasification Combined Cycle power systems program. Once operational, this PDU will be used to develop process scale-up and performance data for a number of configurations and to demonstrate fully coupled sulfidation-regeneration operations. Its size and gas throughput should also enable the PDU to address some of the actual engineering design and control issues associated with fluid-bed, HGD processes. Fluid beds and transport reactors, either alone or in combination, are conceptually attractive for HGD processes for a number of reasons, including: Continuous steady-state operation, which simplifies system control strategies; good temperature control, which reduces the potential for sorbent sintering during regeneration; and potentially wide range of regeneration gas SO_2 concentrations, which adds to process flexibility for sulfur recovery options. The METC Office of Technology Base Development has been providing lab- and bench-scale experimental support to DOE's fluid-bed, HGD development efforts since 1988. This continuous-flow PDU will enable further technology development and testing to proceed at a much larger engineering scale.

21 (DOE/PC/88818–T2) **Catalytic Two-Stage Liquefaction (CTSL™) process bench studies and PDU scale-up with sub-bituminous coal: Final report.** Comolli, A.G.; Johanson, E.S.; Karolkiewicz, W.F.; Lee, L.K.T.; Stalzer, R.H.; Smith, T.O. Hydrocarbon Research, Inc., Princeton, NJ (United States). Mar 1993. 622p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88818. Order Number DE93041182. Source: OSTI; NTIS; GPO Dep.

Reported are the details and results of Laboratory and Bench-Scale experiments using sub-bituminous coal conducted at Hydrocarbon Research, Inc., under DOE Contract No. DE-AC22-88PC88818 during the period October 1, 1988 to December 31, 1992. The work described is primarily concerned with testing of the baseline Catalytic Two-Stage Liquefaction (CTSL™) process with comparisons with other two stage process configurations, catalyst evaluations and unit operations such as solid separation, pretreatments, on-line hydrotreating, and an examination of new concepts. In the overall program, three coals were evaluated, bituminous Illinois No. 6, Burning Star and sub-bituminous Wyoming Black Thunder and New Mexico McKinley Mine seams. The results from a total of 16 bench-scale runs are reported and analyzed in detail. The runs (experiments) concern process variables, variable reactor volumes, catalysts (both supported, dispersed and rejuvenated), coal cleaned by agglomeration, hot slurry treatments, reactor sequence, on-line hydrotreating, dispersed catalyst with pretreatment reactors and CO_2/coal effects. The tests involving the Wyoming and New Mexico Coals are reported herein, and the tests involving the Illinois coal are described in Topical Report No. 2. On a laboratory scale, microautoclave tests evaluating coal, start-up oils, catalysts, thermal treatment, CO_2 addition and sulfur compound effects were conducted and reported in Topical Report No. 3. Other microautoclave tests are described in the Bench Run sections to which they refer such as: rejuvenated catalyst, coker liquids and cleaned coals. The microautoclave tests conducted for modelling the CTSL™ process are described in the CTSL™ Modelling section of Topical Report No. 3 under this contract.

22 (EGG–2712) **A combined physical/microbial process for the beneficiation of coal.** Andrews, G.F.; Stevens, C.J.; Noah, K.S.; McIlwain, M.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE93041252. Source: OSTI; NTIS; GPO Dep.

A large-laboratory scale physical/microbial process was demonstrated for the removal of pyritic sulfur from coal. The process took place in an aerated-trough slurry reactor with a total slurry volume of 150 L. The reactor was divided into six sections, each of which acted as a physical separator and a bioreactor. The process objective was to physically remove the larger pyritic inclusions and to biodegrade the small inclusions (micropyrite). The process was

continuously operated for 120 days, treating approximately 1 ton of Illinois #6 coal. Ninety percent pyrite removal was achieved at a 20% slurry concentration and a reactor residence time of 5 days. Additional research should be performed to find the optimum values for reactor residence time, slurry concentration, and process hydraulic residence time (or recycle ratio). Finding these optimum values will enable a process to be developed that will maximize the amount of coal that can be processed per unit reactor volume per unit time with the desired level of pyritic sulfur removal.

23 (ETDE/JP-mf–94714745, pp. 17-23) **Reduction of coke oven heat consumption by means of coal moisture control plant (CMC) for No.1-3 coke-oven batteries.** Nippon Steel Chemical Co. Ltd., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Various corrective actions have been taken in order to reduce heating value required for dry distillation from the viewpoint of improvements to be made on coke oven operation or combustion control. The water contained in coal, which affects the heating value required for dry distillation, differs depending on each brand of coal or season. Accordingly, a coal dryer has been newly introduced to reduce heating value required for dry distillation by reducing the water content in coal. A coal-in-tube type coal dryer has been employed due to its less power consumption, superior wear resistance, layout ability, engineering ability, etc. The merit by this energy conservation was estimated to be 601 million yen/year. Rate of energy conservation was 11%. By enhancing the quality of coke after humidity adjustment, cheaper non-coking coal can be additionally blended. Furthermore, by enhancing high-density of coal after humidity adjustment, the quality of coal to be loaded into one oven was increased, thereby enabling the productivity to be improved by approximately 7%. 7 figs., 3 tabs.

24 (EUR–14068) **Development of gas cleaning systems for use in conjunction with industrial fuel gas processes.** Commission of the European Communities, Luxembourg (Luxembourg). 1992. 77p. Contract 7220-EC 833. Source: OSTI; NTIS (US Sales Only).

Removal of hydrogen chloride, hydrogen sulphide, tars and particulates from fuel gas produced in Industrial Fuel Gas (IFG) processes has been investigated. The cleaning needs to be undertaken with minimal gas cooling to keep the process simple and maximize thermal efficiency. The object of the work is to provide cleaned fuel gas at 500-600 deg C. The project was split into sections: gaseous contaminant removal and particulate removal. Hydrogen chloride removal was demonstrated in a fixed bed reactor with two sorbents. Sodium carbonate had a retention capacity of 484 g chloride/kg sorbent whilst limestone showed a retention capacity of 313 g chloride/kg sorbent. Initial retention efficiencies were 97% and 89% respectively. Hydrogen sulphide concentrations were also reduced by these sorbents. Sodium carbonate reduced levels by 60% and limestone by 47%, giving hydrogen sulphide concentrations of 200 vpm and 400 vpm respectively. Work on particulate removal showed that the crossflow filter was not suited to this application because of the high pressure drop produced in the samples tested. However, a lightweight ceramic fibre candle type filter element was produced which showed much promise with a collection efficiency of 99.3% over a 92 hour test period. The gaseous contaminant and particulate removal functions were combined by using an entrained flow reactor terminated with a candle filter unit. This was tested with fine (-0.03 mn) limestone as a sorbent injected via the gasifier. At a gas duct temperature of 700 deg C, hydrogen chloride concentrations were reduced by 91% at a calcium to chloride ratio of 5.3:1. Hydrogen sulphide levels were also reduced by 88%. (author). 13 refs., 20 figs., 23 tabs.

25 (IS–5092) **Annotated bibliography of methods for determining sulfur and forms of sulfur in coal and coal-related materials.** Chriswell, C.D.; Norton, G.A.; Akhtar, S.S.; Straszheim, W.E.; Markuszewski, R. Ames Lab., IA (United States). Jan 1993. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94001722. Source: OSTI; NTIS; GPO Dep.

Over 400 published papers, presentations at scientific meetings, and reports relating to the determination of sulfur and sulfur forms in coal-related materials have been accumulated, classified, and an evaluation made of their content.

26 (IS-M–764) **Hydrothermal pretreatment of coal before molten caustic leaching.** Akhtar, S.S.; Chriswell, C.D. Ames Lab., IA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931014–2: 5. international conference on processing and utilization of high sulfur coals, Lexington, KY (United States), 24-28 Oct 1993). Order Number DE94000693. Source: OSTI; NTIS; GPO Dep.

A hydrothermal pretreatment of coal samples before caustic leaching results in efficient sulfur removal using reduced amounts of caustic and to recovery of a higher fraction of the energy content of the feed coal than caustic leaching without the pretreatment. Pretreating an Illinois No. 6 coal with boiling water followed by a float-sink separation using 50% aqueous NaOH as the heavy medium, and then leaching the floated coal with only the caustic adhering to the float portion (less than 1 part caustic to 1 part water to 1 part coal) at 390°C for 15 minutes led to the same residual levels of sulfur in the cleaned coal (0.5%) as was obtained performing the float-sink procedure and leaching procedures on a non-prewashed coal using 2.4 parts caustic to 1 part coal. When prewashed Illinois No. 6 coal was leached with lesser amounts of caustic, the energy recoveries in the cleaned coal were about 5–10% higher than when non-prewashed coal was leached with the larger amounts of caustic.

27 (NEDO-GET–9207) **Survey on fixation and utilization of carbon dioxide. 3.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 218p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714885. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The paper studies an evaluation method to construct a total system for CO2 fixation and effective utilization. This system, which presumes a catalytic hydrogenation methanol synthesis system, transports high purity CO2 recovered in Japan to overseas, synthesizes methanol from the CO2 and hydrogen produced in local sites, and transports it to Japan for consumption. The required conditions for CO2 separation/concentration process are met by the absorption method, the simple 2-step cascade membrane separation method, the membrane/adsorption hybrid method, etc. As synthesis process, studied are compression, reaction, heat recovery, recycling and refining systems. In the hydrogen production process, optimization of the hydrogen electrolysis plant is studied using mainly solar energy as an energy source for hydrogen production by water electrolysis. In trial estimation, 2000 tons/day methanol synthesis are presumed. This is equivalent to treatment of 1/4 of the flue gas from a 1-million kW class coal fired power plant. About 90% of the energy necessary for the system operation are used for hydrogen production. Therefore, the use of hydroelectric power and solar energy is indispensable. 127 refs., 104 figs., 68 tabs.

0105 Products and By-Products

28 (ETDE/JP-mf–94714745, pp. 24-28) **Energy-conservation by reduction of reflux ratio at aromatics recovery tower of benzene plant.** Kawasaki Steel Corp., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

The data of solvent concentration in the extraction oil taken out from the top of aromatics recovery tower of benzene plant have been investigated. As a result, it was found that approximately 70% of the data went to 5ppm or less, while the control standard is less than 10ppm. This fact suggests that the former reflux ratio at the aromatics recovery tower can be reduced. Accordingly, the temperature of the tower bottom was decreased to 176 centigrade from 180 centigrade, and the reflux ratio was reduced up to 0.5.

The fuel gas consumption was successfully reduced due to this improvement. The reduction was 2.34×10^9Kcal/year, which was equivalent to approximately 12% of energy consumption at the aromatics recovery tower. In addition, solvent flowing into or remaining in the extraction oil was reduced, although the reflux ratio was reduced. This was because he solvent flowing into or remaining in the extraction oil can be detected by monitoring fluid temperature. 6 figs., 1 tab.

0106 Properties and Composition

Refer also to citation(s) 1249

29 (CONF-930904–11) **Immobilised sulphur compounds as solid calibrants for TPR.** Ismail, K. (Strathclyde Univ., Glasgow (United Kingdom). Dept. of Pure and Applied Chemistry); Garcia, R.; Mitchell, S.C.; Snape, C.E.; Buchanan, A.C. III; Britt, P.F.; Franco, D.; Yperman, J. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 7. international coal science conference; Banff (Canada); 12-17 Sep 1993. Order Number DE94000477. Source: OSTI; NTIS; INIS; GPO Dep.

Sulphur compounds immobilised on silica are ideal calibrants for TPR (temperature programmed reduction) and should find applications in other techniques, for example, Ledge XANES and temperature programmed oxidation being used to specify organic sulphur forms in coals. The atmospheric pressure TPR traces of the non-thiophenic compounds investigated are dominated by high temperature peaks from secondary reactions which do not appear to be affected by immobilisation on the silica. As a consequence of the high surface coverages used, such reactions are still evident with 150 bar hydrogen although the characteristic reduction temperatures of the non-thiophenic compounds investigated are all below 400°C and well resolved from that of dibenzothiophene. The high pressure TPR experiments on the immobilised substrates have validated the previous conclusions on coals.

30 (DOE/ER/13537–2) **[Determination of the distribution of hydrogen in coal by FTIR]: [Annual report, May 31, 1987–April 30, 1988].** Pennsylvania State Univ., University Park, PA (United States). [1988]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13537. Order Number DE94000876. Source: OSTI; NTIS; GPO Dep.

The aim of our research program is to obtain a fundamental understanding of coal structure. As originally formulated, most of the work was to involve FTIR measurements of the aliphatic and aromatic CH contents of coal. Our research can now be reclassified into two related thrusts. The first continues along the lines of the original proposal developing, and applying FTIR methods for the structural characterization of coal. This can be regarded as a study of "local" structure or microstructure ie. the quantitative determination of the number and type of functional groups present. The second area is concerned with "global" or macroscopic properties of coal, principally the solution thermodynamics of soluble material and the swelling, of the insoluble network. The principal link between the two areas is the role of hydrogen bonding. Strong, specific interactions of this type cannot be described by the mean field theories of polymer physical chemistry that have so far been applied to coal networks (3-11). We discussed these problems in a paper presented at the last ACS meeting a and a copy is attached. In recent work we have now made what we consider to be a significant advance in this area through the adaptation of association models (12-14). These allow the determination of the free energy changes that are a result of hydrogen bonding interactions in a mixture or solution through the definition of appropriate equilibrium constants. We have also demonstrated that these constants can be determined by infrared spectroscopy (12). As a result, we have developed a description of the thermodynamics of coal solutions that we believe should be applicable to a number of problems in coal science.

31 (DOE/ER/13537–T6) **[Determination of the distribution of hydrogen in coal by FTIR]: Technical progress report, [May 31, 1990–April 20, 1991].** Pennsylvania State Univ., University Park, PA (United States). [1991]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13537. Order Number DE94000871. Source: OSTI; NTIS; GPO Dep.

The aim of our research program is to obtain a fundamental understanding of coal structure. As originally formulated, most of the work was to involve FRIR measurements of the aliphatic and aromatic CH contents of coal. The role of the other principal hydrogen containing functional group, OH, was only mentioned in passing. It is well-known, however, that infrared spectroscopy is perhaps the most sensitive tool for the detection of hydrogen bonding interactions (1) and we recently published an FTIR study of hydrogen bonding in coal (2) (reprint attached). This has led us into a new area, the thermodynamics of coal solutions and the swelling of coal networks, and we believe we have an interesting and exciting new approach to the problems in this field.

32 (DOE/MC/10637–93/C0204) **Coal Ash Behavior in Reducing Environments.** Benson, S.A.; Erickson, T.A.; Brekke, D.W.; Folkedahl, B.C.; Tibbetts, J.E.; Nowok, J.W. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC10637. (CONF-9306148–18: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019864. Source: OSTI; NTIS; GPO Dep.

A series of tests have been conducted on two coals with the PDTF under various conditions (temperatures ranging from 1100° to 1500°C, pressures ranging from 50 to 100 psi, O/C ratios ranging from 1.0 to 2.0, and residence times ranging from 5 to 13 seconds). In summary, the results from the pressurized drop-tube furnace testing show differences in the inorganic transformations as a function of temperature residence time and coal type. The gas atmosphere and pressure did not have a visibly substantial effect on the results. It is expected that in a full-scale system that is oxygen- and/or air-blown, the initial atmosphere that the particles see will be similar regardless of amount of oxygen/air, but during the later stages the gas compositions will be significantly different. This would impact the vapor species, such as sodium, the most. The formation of calcium sulfide appears limited by high temperatures and longer residence times. This is primarily due to the instability of calcium sulfide at high temperatures. Iron sulfide, formed form the pyrite content in the coal, has a kinetically limited life in the high temperature regions of a gasification reactor. The iron sulfide decomposes to form metallic iron and iron aluminosilicates. The iron sulfides wet the surfaces of aluminosilicates during gasification to form sticky capture layers on the outside of the particles. Assuming the residence time within the reactor is short, some of the iron sulfide will exit without total decomposition, resulting in a sticky surface for deposition. Sodium, generally organically associated, appears to form sodium sulfide upon initial volatilization and quickly condenses on the surfaces of coalescing clay particles. The sulfide is not stable for long in the environment and results in the formation of sodium aluminosilicates.

33 (DOE/PC/89785–15) **The single electron chemistry of coals: [Quarterly report], April 1–June 30, 1993.** Larsen, J.W.; Rothenberg, S.E. Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry. [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89785. Order Number DE94002049. Source: OSTI; NTIS; GPO Dep.

Objective was to investigate the sing'e electron reactions of alkyl and alkoxy aromatic compounds and the role of these reactions in the chemistry of coal. During this period, the reactions of Illinois No. 6 coal with tetracyanoethylene (TCNE) was studied using diffuse reflectance infrared spectra. Results showed that no chemical reaction occurred, either Diels-Alder or addition, even at 180 C; TCNE's lowest unoccupied molecular orbital was still occupied 2/3 of an electron transferred by Illinois No. 6 coal.

34 (DOE/PC/91283–T8) **Liquid chromatographic analysis of coal surface properties: Quarterly progress report, April–June 1993.** Kwon, K.C.; Rigby, R. Tuskegee Univ., AL (United States). Dept. of Chemical Engineering. [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91283. Order Number DE94002402. Source: OSTI; NTIS; GPO Dep.

Experiments were performed on equilibrium adsorption of probes (2-methyl-1-pentanol (2M1P), 1-heptanol, benzene, toluene) on 60-200 mesh Illinois 6 coal, Adaville 1 coal, Wyodak coal, and Pittsburgh 8 coal. Equil. loadings of toluene are higher than those of benzene on the 4 coals. The aromatics (tolene, benzene) obey the Langmuir isotherm model for single-layer adsorption up to 100 ppM. Loadings of 2M1P and 1-heptanol do not follow both the Langmuir and the Freundlich empirical model. Flotation of the coals, equilibrated with aq. solns. of 2M1P and 1-heptanol, increase linearly with Equil. loadings. Equil. adsorption loadings of 1-heptanol on Illinois 6 coal increase with decreased adsorption temperature.

35 (DOE/PC/91283–T9) **Liquid chromatographic analysis of coal surface properties: Quarterly progress report, July–September 1993.** Kwon, K.C.; Rigby, R.R. Tuskegee Univ., AL (United States). Dept. of Chemical Engineering. [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91283. Order Number DE94002401. Source: OSTI; NTIS; GPO Dep.

Flotation was carried out on 60-200 mesh Illinois 6 coal, Adaville 1 coal, Wyodak coal, and Pittsburgh 8 coal. (The coals were treated with steam, N_2, and air at 1 atm, 125-225 C for 24 h.) Flotation of Wyodak coal (N_2 treated) is higher than that of untreated coal. Flotation of Adaville 1 coal (air treated) is slightly higher than untreated, whereas flotation of Adaville 1 coal (air treated) is slightly lower. Flotation of Illinois 6 coal (N_2 treated) is higher than untreated. This flotation increases with air treatment temperature, while flotation after N_2 treatment decreases with treatment temperatures. Flotation of Pittsburgh 8 coal (air treated) is lower than untreated, and decreases with treatment temperatures.

0108 Waste Management

Refer also to citation(s) 90, 670, 924

36 (AAA-KTF/FKF–90/9) **Sintering of ashes: A laboratory scale testing method.** Skrifvars, B.J. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 63p. (In Swedish). Order Number DE94709676. Source: OSTI; NTIS.

The laboratory test methods for sintering tendency of flue gas ashes has been developed in this work. The method is based on testing of compression strength of sintered cylindrical test specimen produced of synthetic ash. Special attention has been paid to how the chemical composition of the ash and the sintering atmosphere effects on sintering. Certain tests have been made using ashes collected from operational conditions. The test methodology in three different appliances, soda recovery boilers, peat gasifiers, and desulfurizers, have been reviewed in this thesis.

0109 Environmental Aspects

Refer also to citation(s) 57, 827, 863, 864, 865, 1259, 1265, 1312, 2804

37 (NEDO-C–9204) **Research and development support work by coal production/utilization technology promotion subsidies. 2.: Study of clean coal technology trend in Europe.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 213p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714916. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The paper investigates EC's energy policy and European energy technology utilization promotion policy in response to global environmental problems. To stabilize CO2 emission in 2000 to the 1990 level, EC proposes an ALTENER project in which attention is paid to shift to natural gas, Thermie activity and renewable energy resources, and a SAVE project in which improvement in energy efficiency takes priority. However, it is difficult to achieve the target only by technical development, and therefore introduction of coal/energy taxes is also proposed. Energy from outside the EC is also considered to be important, and Pan-European Energy Charter tries to find political framework for East-West cooperation including East Europe and former U.S.S.R. for the purpose of increasing energy trade. Concerning natural gas supply, well-balanced supply from outside the EC is aimed at together with promotion of its exploration and production inside the EC. The paper further describes energy prices and oil refining in the EC, assistance from EC to East Europe and CIS, and energy cooperation with developing countries. 11 figs., 33 tabs.

0110 Reserves, Geology, and Exploration

Refer also to citation(s) 866

38 (NEDO-P–9221) **Study of technical development issues concerning coalbed methane resources.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 115p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714904. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Discussions have been given on a coalbed methane (CBM) resource utilizing system as an oil-alternative energy source. The production method consists of drilling wells all the way to the promising coal seams, followed by performing hydraulic fracturing and cavity completion as a well stimulating treatment. The component comprises methane at 95% which can be used as a raw material for methanol and LNG as in natural gas, but has a problem that gas field is generally small. If the gas degassed from shafts to assure safety and improve productivity of coal mining can be used effectively, it will contribute largely to cost reduction. It can also contribute to suppress discharge of methane into atmosphere and preserve regional environments. Australia has discussed a plan to produce CBM, convert it into methanol or LNG at sites, and export it to Japan as a fuel. The product cost available at wells was calculated 0.79 US dollars/MM Btu. Calculated costs present 2.09 yen/10^3kcal in 1000-ton per day methanol production scale and 2.67 yen as a station arrival cost. This result means that methanol conversion is more advantageous and practical in terms of scale and economy than with LNG conversion. 48 refs., 32 figs., 22 tabs.

0120 Mining

Refer also to citation(s) 866, 2247

39 (ETDE/JP-mf–94714703) **Studies on the measurement of subsurface fractures and geostress using acoustic emission technique for deep coalbed development.** Seto, M. (National Institute for Resources and Environment, Tsukuba (Japan)); Utagawa, M.; Katsuyama, K.; Kiyama, T.; Narita, T.; Kono, S. National Inst. for Resources and Environment, Tsukuba (Japan). 11 Jun 1993. 129p. (In Japanese). Order Number DE94714703. Source: OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan.

This paper reports studies carried out by the National Institute for Research and Environment on application of acoustic emission technique to predicting fracture propagation in coals and coal measure rocks and measuring geostress for the purpose of applying the technique to developing deep coalbed. Only the titles to each chapter in the report are listed as follows: Acoustic emission measuring systems, and acoustic emission generating behavior of coals and rocks under compressive stress; propagating behavior in hydraulically fractured cracks in rocks having developed rift and discontinuity plane; distribution of cracks built in coal measure rock beds during a hydrofracture field experiment in a coal shaft; application of the acoustic emission technique to evaluating geostress (relation between acoustic emission Kaiser effect of rocks and microcracking); estimation of preceding stress from rocks with stress hysteresis using acoustic emission generating characteristics during repeated loading, and the effect of elapsed time; and application to cored rocks of the preceding stress estimation method using the acoustic emission generating characteristics during the repeated loading. 80 refs., 146 figs., 2 tabs.

0140 Combustion

Refer also to citation(s) 3, 32, 159, 647, 650, 651, 656, 664, 926, 936, 1001, 1891, 1892, 1905

40 (AAA-KTF/FKF–90/5) **Formation of nitrous oxide from ammonia on lime surfaces.** Iisa, K; Santala, P.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 14p. Order Number DE94709673. Source: OSTI; NTIS.

LIEKKI Research Programme.

N_2O is found in quantities 30-100 mg/MJ in the flue gases from fluidized bed combustion. In this work the possible catalytic formation of N_2O from ammonia - an important intermediate in the conversion of fuel nitrogen in fluidized bed combustion - was studied. Limestone and quartz sand were used as catalytic materials since they are present in large quantities in fluidized bed combustion units. The catalytic effects of both calcined and sulphated limestone were tested. The experiments were made in a laboratory fixed bed reactor in the temperature range 750-950 deg C. The formation was tested also in an empty reactor. The oxidizing agents in this study were nitric oxide and oxygen. Considerable amounts of N_2O were formed from ammonia on calcined limestone surfaces at temperatures 750-950 deg C when oxygen was present, but none when the concentration of O_2 was less than 0.5 %. No formation of N_2O was detected on sulphated lime, quartz sand or an empty reactor. Formation of N_2O was found to be increased when any of the concentrations of the reactants - NH_3, NO or O_2 - was increased. At the temperature range 750 -950 deg C there was a maximum in the formation of N_2O around 850 deg C for both the reactions $NH_3 + O_2$ and $NH_3 + NO + O_2$. At this temperature around 15 % of all the incoming N (NH_3 and NO) was converted to N_2O. At the same temperature there was a minimum in the outlet concentration of NO.

41 (AAA-KTF/FKF–90/6) **Catalytic destruction of N_2O in a fixed bed laboratory reactor.** Santala, P.; Iisa, K.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 22p. Order Number DE94709674. Source: OSTI; NTIS.

LIEKKI Research Programme.

Utilization of a fixed bed reactor, calcined limestone, sulphated limestone and peat ash were shown to catalyze the destruction of N_2O under conditions relevant to fluidized bed combustion. Calcined limestone was found to be the most active catalyst. Using a bed of calcined limestone and quartz sand mixed in the ratio 1:100, over 50 % of the N_2O was destroyed at 700 deg C. Quartz sand alone was shown to catalyze the destruction of N_2O but the effect was small between 700-850 deg C. N_2O decomposed even in an empty reactor at temperatures above 800 deg C. The reactions over calcined limestone and quartz sand were both calculated to be first order in N_2O. The activation energies were 59 and 108 kJ/mol for calcined limestone and quartz sand respectively. The decomposition of N_2O through a homogenous gas phase reaction was also found to be first order in N_2O with and activation energy of 191 kJ/mol. The catalytic destruction of N_2O over calcined limestone was not controlled by diffusion of these experiments.

42 (AAA-KTF/FKF–90/13) **Kinetic modelling of gas phase nitrogen chemistry in combustion.** Kilpinen, P. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 168p. Order Number DE94709679. Source: OSTI; NTIS.

LIEKKI Research Programme.

This thesis deals with studies of homogenous, gas-phase nitrogen chemistry in combustion using detailed chemical kinetic modelling. A comprehensive gas combustion model containing the oxidation reactions of the simple hydrocarbons (CH_4, C_2H_6) and the reactions of nitrogen species in combustion has been used to study how different factors, such as time, temperature, and air/fuel stoichiometry, affect on the formation and destruction of nitrogen oxides in combustion, at a number of conditions relevant for practical applications. The model consists of about 250 elementary reactions and 50 chemical species. The results of the calculations have also been compared with experimental data from laboratory studies and full scale applications. The thesis consists of three papers. In the first paper the model was applied to study, at conditions relevant for fluidized bed combustion, the importance of the homogenous gas phase reactions of the volatile fuel-nitrogen species (NH_3, HCN) to the formation of nitrous oxide (N_2O). Calculations were performed by assuming ideal plug flow. In the second paper the model was applied to study the reburning chemistry of natural gas. The most important reaction paths for the reduction of NO were identified, and the optimum conditions were determined in the primary, reburn, and burn-out zone, respectively. Calculations were performed by assuming ideal plug flow. The detailed chemistry of the model was used in the third paper to predict the NO_x emissions from 8 MW heavy fuel oil furnace.

43 (AAA-KTF/FKF–91/2) **SO_2 absorption with alkaline reactants at high temperatures.** Uusikartano, T. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 83p. (In Swedish). Order Number DE94709680. Source: OSTI; NTIS.

This thesis consists of five parts, in which the sulfatizing of Na_2CO_3 and $CaCO_3$ have been studied. Decomposition of $CaCO_3$ has been studied in the literature review. The surface and pore structure of limestones have been made using Hg-porosimetry. The parts of the thesis are: Kinetics of sulfation of Na_2CO_3 in flue gases; the influence of temperature on the SO_2 absorption by limestones in fluidized bed combustors; surface characteristics of thermally decomposed $CaCO_3$; A study of the mineralogy, porosity and microstructure of two technical limestones and influence of the amount of sample on the porosities obtained with loose particle beds.

44 (AAA-KTF/FKF–91/5) **Influence of limestone on sulfur and nitrogen chemistry in fluidized bed combustion.** Iisa, K. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 128p. Order Number DE94709681. Source: OSTI; NTIS.

LIEKKI Research Programme.

This thesis is a collection of papers dealing with both the desulfurization reactions in fluidized bed boilers and the catalytic effect of limestone on reactions involving nitrogen oxides. For desulfurization the emphasis is on removal of SO_2 under conditions typical for pressurized fluidized bed combustion The catalytic NO_x reactions have been studied at atmospheric pressure. The thesis consists of an introductory part and 5 papers. The introductory part contains a brief description of fluidized bed combustion as well as overviews of sulfur and nitrogen chemistry in fluidized bed combustion. Desulfurization by limestone is reviewed with special emphasis on pressurized conditions. Both the formation of NO and N_2O in fluidized bed combustion is discussed. Desulfurization by limestone was studied in the first paper under conditions relevant to pressurized fluidized bed combustion. The sulfation of $CaCO_3$ was investigated in a pressurized thermogravimetric apparatus. The second paper is a literature survey of the catalytic reactions involving NO and NH_3. The reactions in which NO is reduced or NH_3 oxidized are included. The third and fourth papers include experimental studies of catalytic reactions of nitrogen compounds under fluidized bed combustion conditions. The reduction of NO by carbon monoxide was studied in the third paper the formation of N_2O from ammonia in the fourth paper, and the decomposition of nitrous oxide in the fifth paper.

45 (AAA-KTF/FKF–91/7) **Fluidized bed combustion - prospects and role.** Hupa, M.; Bostroem, S. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 26p. Order Number DE94709700. Source: OSTI; NTIS.

Fluidized bed combustion (FBC) is a widespread commercial combustion technique with more than 700 units in operation and with a total thermal capacity of almost 30 000 MW. About 90 % of this capacity is in the following eight countries: U.S., FRG, France, Japan, India, U.K., Finland and Sweden. The main fuel in the installed FBC boilers is coal, but also low grade fuels and wastes are common. The circulating fluidized bed (CFBC) technique has strongly increased its share in comparison to the bubbling bed technique (BFBC) during the last five years, and today about two thirds of the total installed capacity consists of CFBC boilers. In FBC the flue gas emissions can be maintained at significantly lower

levels than in conventional combustion techniques by different relatively simple emission control techniques. Emission control is more effective in the CFBC than in the BFBC systems. Sulphur oxides can be reduced by 90 % or even more by limestone addition. Nitric oxide emissions (NO_x) can be controlled by staging the air supply into the furnace. This way levels of less than 150 mg NO_2/MJ (200 ppm) can be considered achievable in BFBC, and levels of less than 70 mg NO_2/MJ (90 ppm) in CFBC. Additional NO reduction may be obtained with the selective non catalytic NO_x reduction technique by ammonia addition in the flue gases or in the hot cyclone of the CFBC. Advanced, pressurized FBC (PFBC) concepts are having their first full scale demonstrations in operation.

46 (AAA-KTF/FKF–91/8) **Compilation of gas phase sulfur reactions for combustion modelling.** Duo, W.; Kilpinen, P. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 53p. Order Number DE94709682. Source: OSTI; NTIS.

LIEKKI Research Programme.

This report contains a kinetic data compilation of gas phase chemical reactions occurring in the combustion of sulfur containing compounds. The scope and the structure of the database is presented. The reactions compiled are summarized in the form of a matrix. The compilation may serve as a database for establishment of a reliable kinetic model to describe the sulfur combustion chemistry under both oxidizing and reducing conditions and to describe the influence of sulfur species on nitrogen chemistry. It may also be a useful reference to studies of atmospheric chemistry.

47 (AAA-KTF/FKF–91/10) **Kinetics of gas phase sulfur reactions in combustion: A review.** Duo, W.; Kilpinen, P.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 55p. Order Number DE94709684. Source: OSTI; NTIS.

LIEKKI Research Programme.

This report is a literature review on gas phase sulfur chemistry in combustion and a suggested kinetic model for H/S/O reactions. The review has been focused on the behaviour of sulfur species as a minor component in combustion of main fuels. Emphasis has been particularly given to the influence of fuel sulfur on the formation and destruction of nitrogenous species. The composition of the present kinetic mechanism is based on the kinetic data compilation of gas phase sulfur reactions and the discussions of available experimental evidences and previous models. Further work to verify the model is suggested.

48 (AAA-KTF/FKF–92/5) **Sulfur capture under pressurized fluidized bed combustion conditions.** Iisa, K. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 154p. Order Number DE94709690. Source: OSTI; NTIS.

LIEKKI Research Programme.

This thesis discusses the sulfur capture by limestone in both pressurized fluidized bed combustion and gasification. It consists of introductory part and five papers. Papers 1-3 deal with the capture of sulfur dioxide in pressurized fluidized bed combustion and the papers 4-5 with the capture of hydrogen sulfide in pressurized fluidized bed gasification. Papers 1-3 and 5 include experimental studies made in a pressurized thermogravimetric apparatus under conditions relevant to either fluidized bed combustion or gasification. The limiting processes and kinetics of the sulfur capture reactions are discussed in the papers. Paper 4 is an equilibrium analysis of sulfur capture in pressurized combustion and gasification processes.

49 (AAA-KTF/FKF–92/7) **Kinetic modelling of gas-phase nitrogen reactions in advanced combustion processes.** Kilpinen, P. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 214p. Order Number DE94709692. Source: OSTI; NTIS.

LIEKKI Research Programme.

This thesis deals with studies of gas-phase reactions of nitrogen compounds, using detailed kinetic modelling. The work has shown that with the present knowledge of nitrogen combustion chemistry, detailed kinetic modelling is a useful and viable tool for making parametric studies on the nitrogen reactions under many conditions relevant for practical combustion systems. In spite of many uncertainties in the models' parameters, the models seem to give valuable information about the trends how different parameters affect on the formation and destruction of the nitrogen compounds. This way they can assist in interpretation and understanding of experimental results obtained and provide support for further experimental work. Many parameters - time, temperature gas concentrations - can be varied easily. The models also give valuable information on other possible side-reactions. For many NO_x reduction methods, the interaction between lowering NO_x and increasing some other pollutant, e.g. CO, can be found.

50 (DOE/MC/24132–93/C0234) **AEP's program for enhanced environmental performance of PFBC plants.** Hafer, D.R.; Bauer, D.A. American Electric Power Service Corp., Columbus, OH (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24132. (CONF-930433–8: 55. annual American power conference, Chicago, IL (United States), 13-15 Apr 1993). Order Number DE93019876. Source: OSTI; NTIS; GPO Dep.

While Tidd has achieved many of its original performance and test objectives, current emission standards and the projected performance of competing technologies have caused a reassessment of the goals of AEP's PFBC program, particularly with regard to sulfur removal and sorbent utilization. The original goal of 90 percent sulfur removal at a Ca/S molar ratio of 1.6 (using Plum Run dolomite) has now been revised to 95 percent removal at a ratio of less than 1.8. While 95 percent sulfur capture is within the capability of today's PFBC units, the desired Ca/S molar ratio is not presently possible. Therefore, the test program has been redirected to attain this goal. The remainder of the three-year demonstration period will focus on achieving better sorbent utilization, conducting feedstock testing, and performing process evaluations. In addition, a significant part of the remaining test effort at Tidd will focus on establishing and validating the design basis for future commercial PFBC plants. Items being considered to improve sorbent utilization include better sorbent distribution in the bed, optimization of sorbent sizing, ash recycling or recirculation, and selection of sorbent.

51 (DOE/MC/24207–3323) **Fundamental study on transient bubble (slug) behavior by characterizing transient forces of solid particles in fluidized beds: Topical report, January 1991–June 1992.** Kono, H. West Virginia Univ., Morgantown, WV (United States). Dept. of Chemical Engineering. Oct 1992. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24207. Order Number DE93000259. Source: OSTI; NTIS; GPO Dep.

The objective of this work is to recognize and interpret the signals of transient motion of bubbles (slugs) in fluidized beds (METC/DOE) by measuring and utilizing the signals of transient gas phase pressure fluctuation, and also by taking the video pictures of transient motions of the bubbles and emulsion phase in fluidized beds. The two signals were measured simultaneously in a three dimensional fluidized bed. Correlation study on the voidage signal and pressure fluctuation was carried out. A domain concept was introduced and new bubble classification was suggested. A video recording approach was also developed to record the transient bubble motion in a two dimensional fluidized bed with a special consideration. This new approach enhances the understanding of bubble image and the physical meaning of transient particle forces. The fundamental mechanism of bubble flow was experimentally investigated and interesting new findings of the transient bubble flow were obtained.

52 (DOE/MC/24207–3324) **Engineering models for the gas-solid motion and interaction in the return loop of circulating fluidized beds: Topical report, January 1992–June 1992.** Celik, I.; Zhang, G.Q. West Virginia Univ., Morgantown, WV (United States). Dept. of Mechanical and Aerospace Engineering. Aug 1992. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24207. Order Number DE93000260. Source: OSTI; NTIS; GPO Dep.

It is reported on development, testing and verification of engineering models for predicting the pressure drop, the solids flow rate, and the downcoming gas flow rate through an L-valve for a given aeration flow rate. The models are, in particular, applicable

for studying the one-dimensional gas-solids motion through the return loop of a circulating fluidized bed. A literature review is presented in a comparative manner. One-dimensional transient equations governing the dense two-phase flows are derived. Those equations are then used to deduce relevant characteristic dimensionless parameters. Experimental data from literature have been analyzed and empirical correlations are suggested. A calculation procedure is proposed for predicting relevant gas and solid flow parameters. The model is based on integrated conservation equations for mass and momentum for both phases. Some experiments of our own have been performed and the data have been analyzed. The model is calibrated against experimental data.

53 (DOE/MC/25177–93/C0226) **Alternative high temperature gas piping systems for PFBC.** Rubow, L.N.; Harvey, L.E.; Zalewski, J.T.; DeLallo, M.R. Gilbert/Commonwealth, Inc., Reading, PA (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC25177. (CONF-9306148–38: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040377. Source: OSTI; NTIS; GPO Dep.

A literature/technical paper search to determine current/in-use design methods regarding high temperature piping systems, and material performance and development was completed. After review of the information, those manufacturers whose products were deemed potentially viable were contacted for further technical discussion and information gathering. This information was reviewed and candidate materials were selected. Investigation of the applicability of specific systems such as Mirror All Metal Reflective Insulation and Insulated Steam Injection Tubing were pursued with the manufacturer. "Blue Sky" discussions were held with G/C representatives of nuclear, fossil, and advanced technology systems engineering to identify design issues associated with the hot gas system and to investigate concepts and approaches to developing alternative designs. In order to develop an understanding of the design and operational issues associated with similar high temperature flue gas systems, G/C investigated the performance of the flue gas system at American Electric Power Corporation's PFBC at the Tidd facility. The discussions included design, operation, performance, and modification history. The results of this investigation were that proven methods of protecting flue gas piping from the corrosive effect of acid and the erosive effects of gas stream particulate while providing, thermal insulating capabilities for operating temperatures at or above 1500°F are available.

54 (DOE/MC/27364–93/C0227) **Scale-up of commercial PCFB boiler plant technology.** Lamar, T.W. Ahlstrom Pyropower, Inc., San Diego, CA (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC27364. (CONF-931006–1: Joint power generation conference, Kansas City, MO (United States), 17-21 Oct 1993). Order Number DE93019859. Source: OSTI; NTIS; GPO Dep.

The DMEC-1 Demonstration Project will provide an 80 MWe commercial-scale demonstration of the Pressurized Circulating Fluidized Bed (PCFB) technology. Following confirmation of the PCFB design in the 80 MWe scale, the technology with be scaled to even larger commercial units. It is anticipated that the market for commercial scale PCFB plants will exist most predominantly in the utility and independent power producer (IPP) sectors. These customers will require the best possible plant efficiency and the lowest achievable emissions at competitive cost. This paper will describe the PCFB technology and the expected performance of a nominal 400 MWe PCFB power plant Illinois No. 6 coal was used as a representative fuel for the analysis. The description of the plant performance will be followed by a discussion of the scale-up of the major PCFB components such as the PCFB boiler, the pressure vessel, the ceramic filter, the coal/sorbent handling steam, the gas turbine, the heat recovery unit and the steam turbine, demonstrating the reasonableness of scale-up from demonstration plant to a nominal 400 MWe unit.

55 (DOE/MC/27364–93/C0229) **PCFB environmental performance and efficiency, the Pyropower perspective.** Dryden, R.J. Pyropower Corp., San Diego, CA (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC27364. (CONF-9306148–35: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019898. Source: OSTI; NTIS; GPO Dep.

Figure 1 shows the process flow diagram for the PCFB system that will repower one of the existing steam turbines at the DMEC site. Both coal and limestone are mixed with water into a paste using a two stage mixing process. The resultant paste is pumped into the combustion chamber, located inside a pressure vessel, using piston pumps commonly used in the concrete industry. Combustion air is supplied from the compressor section of the gas turbine. Coal combustion and in-situ sulfur removal take place at approximately 1600° F in the "hot loop" consisting of the membrane wall combustion chamber and the refractory lined hot cyclone. Superheater surface, constructed of super double omega tubing, is located in the upper combustion chamber. This type of surface has been demonstrated successfully in numerous Pyroflow ACFB applications as well as in the PCFB pilot plant. The flue gas leaving the cyclones is cleaned in parallel ceramic barrier filters before being expanded through the gas turbine. The gas leaving the turbine is cooled in a conventional finned tube heat recovery unit before entering the stack. The gas turbine is a standard single shaft, cold end drive industrial machine that has had the center section of the turbine modified. A scroll section has been added to allow for the removal of compressor discharge air from the casing for external firing in the PCFB combustor and to allow for the introduction of hot clean gas back through the casing into the expander section. (This air outlet/gas inlet design is commonly used in recuperative gas turbine cycles.)

56 (DOE/METC/C–93/7089) **The systems and the developmental targets for PFBC.** Dellefield, R.J. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). (CONF-9306148–20: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019871. Source: OSTI; NTIS; GPO Dep.

First generation PFBC technology is nearing commercial deployment the ongoing demonstrations, as part of DOE's Clean Coal Technology (CCT) Program, will enable the technology to be a low-risk, environmentally acceptable option for utilities. Further improvements in environmental and thermal performance will be required to maintain PFBC technology as a competitive option to gasification-based power systems in the 2000s. The cost of electricity, capital costs, emissions, and thermal efficiency of PFBC systems compared to alternatives are covered. The vendors of PFBC systems seem to be responding to these market requirements. Significant progress has been made to increase the efficiency of first generation PFBCs and in reducing the capital cost of first-generation PFBC systems, which should positively influence the number of total sales of new units. The potential for first-generation PFBC systems to be used to retrofit existing utility sites and add a modest increment of power is gaining wide acceptance. Further development of PFBC systems into more efficient, environmentally benign power generation options is continuing. A snapshot of the development activities planned for Advanced PFBC systems, which the DOE considers necessary to develop utility-sized plants, are discussed. The Morgantown Energy Technology Center (METC) is interested in making sure that PFBC systems continue to remain a viable system for the next century, in a climate of continuing pressure, to make power systems cleaner and more efficient. Therefore, METC is initiating an effort to investigate the technical issues associated with PFBC systems that can get to over 50 percent efficiencies and have very low emissions. The goals and development targets for this effort are discussed.

57 (DOE/METC/C–93/7099) **The role of IGCC in USDOE clean coal research, development and demonstration.** Schmidt, D.K.; Rath, L.K. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). (CONF-9309111–4: 10. annual international Pittsburgh coal conference: coal - energy and the environment, Pittsburgh, PA (United States), 20-24 Sep 1993). Order Number DE93019734. Source: OSTI; NTIS; GPO Dep.

For many years, the US Department of Energy (DOE) has been funding research, development, and demonstration (RD&D) projects to develop advanced power generation technologies. The goal of this RD&D is private sector commercialization of technologies that will provide reasonably priced electricity and still meet stringent environmental standards. Integrated Gasification Combined-Cycle (IGCC) systems are emerging as one of the more attractive candidate technologies to meet this goal. The Morgantown Energy Technology Center (METC) has been assigned the responsibility for implementing IGCC projects in DOE's Clean Coal RD&D program. Projects related to IGCC are briefly described.

58 (DOE/PC/90310–T12) **Combustion of dense streams of coal particles: Quarterly progress report No. 11, February 29, 1993–May 28, 1993.** Annamalai, K. Texas A and M Univ., College Station, TX (United States). Dept. of Mechanical Engineering. [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90310. Order Number DE94002179. Source: OSTI; NTIS; GPO Dep.

This report analyses the results obtained from the experiments conducted on a dense stream of particles injected vertically upwards into vitiated air. It is divided into two major sections: gasification efficiency and image analysis. In the first part, the effects of residence time and air fuel ratio over gasification efficiency are presented while the second part provides results on flame structure obtained using image analysis.

59 (ETDE-IT–93-222) **Assessment of derating in industrial boiler designed for fuel oil or natural gas, assuming coal-water slurry (CWS) retrofit.** Pignatelli, T. (ENEA, Casaccia (Italy). Area Energetica); Grinzi, F. 1993. 14p. (CONF-930324–2: Symposium on improved technology for fossil power plants: new and retrofit applications, Washington, DC (United States), 1-3 Mar 1993). Order Number DE94716520. Source: OSTI; NTIS (US Sales Only).

This paper describes the application of a method to analyze the behaviour of oil or gas fired boilers which are using a coal-water slurry. In particular, by means of this methodology (which has been worked out by SAIC, McLean VA, USA on behalf of DOE), the maximum load (derating) is calculated at which the boiler can operate, assuming a CWS retrofit. The theoretical principles on which the methodology is based, the tools that it uses and the limits of application are illustrated. The paper analyzes the results of some calculations (test cases) made by applying the methodology to a plant of the Enichem company in Porto Torres. The analysis highlights that derating is heavily dependent on the chemical-physical characteristics of the coal-water slurry and the physical characteristics of the boiler.

60 (SVF–468) **The effect of particle size of pulverized fuel on combustion efficiency and NO_x emissions - state of the art.** Hjalmarsson, A.K. (AaF Energikonsult, Stockholm (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 89p. (In Swedish). Order Number DE94709786. Source: OSTI; NTIS.

This report presents the state of the art and different results from the effect of particle size on combustion efficiency and NO_x emissions. First a general description is given of combustion of pulverized fuels and different plants burning pulverized fuels in Sweden. An overview of research work in the area is presented. Different measures to improve the results are then described such as improvements on mills through installations of rotating classifiers, new methods for grinding coal, distribution of pulverized fuels from mills to burners and methods for measurements of flow of pulverized fuels to the burners. Results of the effect of particle size are presented from plants in different countries. Finally, examples are given on work by burner manufacturers on the effect of particle size. Most information presented is from pulverized coal, but some information is also from other types of pulverized fuels. 53 refs, 29 figs, 8 tabs

0150 Economic, Industrial, and Business Aspects

Refer also to citation(s) 862, 863, 864

61 (DOE/FE/62046–H1) **Clean Coal Technology: Region 3 Market Description, Mid-Atlantic: Summary.** Technology and Management Services, Inc., Gaithersburg, MD (United States). Sep 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-92FE62046. Order Number DE94000431. Source: OSTI; NTIS; GPO Dep.

The Region 3 Market Description summary provides information that can be used in developing an understanding of the potential markets for clean coal technologies (CCTs) in the Mid-Atlantic Region. This region (which geographically is Federal Region 3) consists of the District of Columbia and the following five states: Delaware, Virginia, Maryland, West Virginia, Pennsylvania. In order to understand the potential market, a description is provided of the region's energy use, power generation capacity, and potential growth. Highlights of state government activities that could have a bearing on commercial deployment of CCTs are also presented. The potential markets characterized in this summary center on electric power generation by investor-owned, cooperative, and municipal electric utilities and involve planned new capacity additions and actions taken by utilities to comply with Phases I and II of the Clean Air Act Amendments (CAAA) of 1990. Regulations, policies, utility business strategies, and organizational changes that could impact the role of CCTs as a utility option are identified and discussed. The information used to develop the Region 3 Market Description is based mainly on an extensive review of plans and annual reports of 17 investor-owned, cooperative, and municipal electric utilities and public information on strategies and actions for complying with the CAAA of 1990.

62 (DOE/FE/62046–H2) **Clean Coal Technology: Region 4 Market Description, South Atlantic: Summary.** Technology and Management Services, Inc., Gaithersburg, MD (United States). Sep 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-92FE62046. Order Number DE94000430. Source: OSTI; NTIS; INIS; GPO Dep.

The Region 4 Market Description Summary provides information that can be used in developing an understanding of the potential markets for clean coal technologies (CCTs) in the South Atlantic Region. This region (which geographically is Federal Region 4) consists of the following eight states: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. In order to understand the potential market. A description is provided of the region's energy use, power generation capacity, and potential growth. Highlights of state government activities that could have a bearing on commercial deployment of CCTs are also presented. The potential markets characterized in this summary center on electric power generation by investor-owned, cooperative, and municipal electric utilities and involve planned new capacity additions and actions taken by utilities to comply with Phases I and II of the Clean Air Act Amendments (CAAA) of 1990. Regulations, policies, utility business strategies, and organizational changes that could impact the role of CCTs as a utility option are identified and discussed. The information used to develop the Region 4 Market Description is based mainly on an extensive review of plans and annual reports of 29 investor-owned, cooperative, and municipal coal-using electric utilities and public information on strategies and actions for complying with the CAAA of 1990.

63 (NEDO-C–9202) **Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 117p. (In Japanese). Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper collects lectures given by national representatives (from Japan, China, Indonesia, Australia, Korea, Malaysia, the Philippines, Taiwan, and Thailand) at the Third Pan-Pacific Workshop, 1992 sponsored by NEDO held in Kuching, Malaysia. This survey report summarizes a survey on trends in Pan-Pacific clean coal technologies (CCT). The survey has been carried out by NEDO in fiscal 1992 as part of the 'Survey on Research and Development Aiding Operations' subsidized from the Agency of Natural

Resources and Energy of the Ministry of International Trade and Industry. In order to promote technological transfers to developing countries, the survey is intended to provide fundamental materials for collecting information on building information network systems for information exchange. The information exchange is aimed at exchanging different items of information among the nations on trends in research and development of the CCT, and possibilities of coal utilization. The national representatives mentioned their views to the demand and supply of coal, with recognition on importance of expanding coal utilization. They also called upon the necessity of developing technologies under international cooperations and overcoming the environmental problems. 14 refs., 13 figs., 26 tabs.

64 (NEDO-C–9202, pp. 12-17) **Coal industry in China.** Ren, L. (Ministry of Energy, Peking (China)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture on China's coal policies given by a Chinese representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). According to data acquired in 1992, coal production in China accounts for 76% of its total energy consumption, this trend being estimated to continue until 2000. Under the nation's rapid economic development, efforts are being made to increase the coal production by 350 million tons in the coming seven years. Problems are: Transportation difficulty because of major production areas existing in the northwest part of the country and consuming areas concentrating in the eastern coastal areas; water shortage in the production zones; or soil natures difficult of mining in the south-west territories and high-sulfur coal, environment, and economic effects. Policies are being applied in specific manners, such as concentrated investments to develop coal mining areas, and construction of railroads and harbors. Such various measures are being carried out as development of hydraulic and nuclear power plants, deregulation of coal prices, and rigorous regulation on pollutions.

65 (NEDO-C–9202, pp. 18-32) **Planning and developing the coal briquetting industry in Indonesia.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture on Indonesia's coal policies given by an Indonesian representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). While Indonesia is blessed with a great variety of energy resources, its consumption has been increasing rapidly in recent years. The Government has announced a collective policy comprising three elements: energy convergence, diversification, and conservation. It intends to diversify energy utilization to escape from the conventional consumption type depending basically on petroleum. Cement industry and power plants are already using coal in place of petroleum. Coal resource utilization is envisaged in small-size industries and general households. While the main fuel used in households has been kerosene, various action plans have been established to raise the ratio of using smokeless briquettes to 30% in the fiscal 1999 and 75% in the fiscal 2004 to realize well balanced energy supply. Expectations are placed on reducing the use of petroleum and firewoods and creating employment opportunities. 5 refs., 5 figs., 5 tabs.

66 (NEDO-C–9202, pp. 33-62) **Prospect on coal as energy source and its important problems.** Brown, C. New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture on Australia's coal policies given by an Australian representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). Coal will hold an important position to meet future energy demand in the Asian territories. Views at different forecasting organizations agree in that the demand for ordinary coals in Asia will nearly double in the coming ten to fifteen years. Achieving reliable growth in the coal supply industry first of all is an important requirement for developing the coal trades. The Australian Government has been taking measures in the aspects of competitive power, price, profitability, and investment. With respect to environmental problems, the energy operation group in APEC, for example has been effecting large progresses in technologies, information exchange and human resource education. To meet diversifying consumer needs, the Government is implementing measures to promote investments in research and development projects and strengthen transportation infrastructures including improvement of harbor facilities. 9 refs.

0160 Health and Safety

67 (DOE/MC/26018–3439) **[Toxicity studies of mild gasification products]: [Quarterly report, January 1, 1993–March 31, 1993].** National Inst. for Occupational Safety and Health, Morgantown, WV (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI21-89MC26018. Order Number DE94000872. Source: OSTI; NTIS; GPO Dep.

Both IST No. 9 and IST No. 10 displayed mutagenic activity only in the presence of S9 metabolic activation. The mutagenicity of IST No. 9 to TA98 (with S9 activation) was low, but positively confirmed using both solvents (Table 1) . The mutagenic activity of IST No. 9 was also detected, as noted in Table 1, on TA100 with S9 activation when solvated in DMSO. Although some doubling of the revertant number was noted in confirmatory tests, no dose-response could be elucidated; therefore, the mutagenicity to TA100 could not be confirmed. The histidine dependence in TA98 is due to a frameshift mutation, which skews the reading frame of the genetic code. The reversion of that mutation requires another frameshift mutation, so the evidence of mutagenic activity on TA98 by IST No. 9 indicates that the sample contains an indirect (requiring activation) frameshift mutagen. IST No. 10 also displayed mutagenic activity on TA98 with metabolic activation (Table 2), again indicating the presence of an indirect-acting frameshift mutagen in the sample. This activity was similar for both solvents. Unlike IST No. 9, the activity of IST No. 10, solvated in DMSO, on TA100 with S9 activation was low,, but met all the criteria to be considered positive. It was also observed in all assays performed, confirming that the test agent is mutagenic to TA100.

02 PETROLEUM

0202 Reserves, Geology, and Exploration

Refer also to citation(s) 71, 73, 1664

68 (DOE/BC/14956–2) **Identification and evaluation of fluvial-dominated deltaic (Class I oil) reservoirs in Oklahoma: Quarterly technical progress report, April 1, 1993–June 30, 1993.** Mankin, G.J. (Oklahoma Geological Survey, Norman, OK (United States)); Banken, M.K. Oklahoma Univ., Norman, OK (United States). 28 Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14956. Order Number DE94001747. Source: OSTI; NTIS; GPO Dep.

The Oklahoma Geological Survey (OGS), the Geological Information Systems department, and the School of Petroleum and Geological Engineering at the University of Oklahoma are engaging in a program to identify and address Oklahoma's oil recovery opportunities in fluvial-dominated deltaic (FDD) reservoirs. This program includes the systematic and comprehensive collection and

evaluation of information on all of Oklahoma's FDD reservoirs and the recovery-technologies that have been (or could be) applied to those reservoirs with commercial success. This data collection and evaluation effort will be the foundation for an aggressive, multi-faceted technology transfer program that is designed to support all of Oklahoma's oil industry, with particular emphasis on smaller companies and independent operators in their attempts to maximize the economic producibility of FDD reservoirs. Specifically, this project will identify all FDD oil reservoirs in the State; group those reservoirs into plays that have similar depositional and subsequent geologic histories; collect, organize and analyze all available data; conduct characterization and simulation studies on selected reservoirs in each play; and implement a technology transfer program targeted to the operators of FDD reservoirs to sustain the life expectancy of existing wells with the ultimate objective of increasing oil recovery.

69 (SAND–93-2012C) **Threat of a sinkhole: A reevaluation of Cavern 4, Bayou Choctaw salt dome, Louisiana.** Neal, J.T. (Sandia National Labs., Albuquerque, NM (United States)); Todd, J.L.; Linn, J.K.; Magorian, T.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9310168–1: Solution Mining Research Institute annual meeting, Lafayette, LA (United States), 24-28 Oct 1993). Order Number DE93040751. Source: OSTI; NTIS; GPO Dep.

Cavern Lake at Bayou Choctaw salt dome resulted from the failure of Cavern 7 in 1954. Uncontrolled solutioning of this cavern through the thin caprock had set the stage for overburden to collapse into the cavern below. A similar situation developed with nearby Cavern 4, but with less dissolutioning of the caprock. Because pressure loss was already a problem and because another 800 ft diameter lake would have endangered surface operations, solutioning of Cavern 4 was stopped and the cavern abandoned in 1957 in order to protect the already-small site. In 1978 the Strategic Petroleum Reserve (SPR) acquired a number of caverns at Bayou Choctaw, including Cavern 4, and the possible repeat of the Cavern 7 failure and formation of another lake thus became an issue. The cavern dimensions were re-sonared in 1980 for comparison with 1963 and 1977 surveys. Annual surface leveling between 1982–1992 showed less subsidence occurring than the site average, and a cavern monitoring system, installed in 1984, has revealed no anomalous motion. Repeat sonar surveys in 1992 showed very little, if any, change occurred since 1980 although a small amount of uncertainty exists as a result of changing sonar techniques. We conclude that significant additional solutioning or erosion of the caprock has not occurred and that there is no increased threat to SPR operations.

0203 Drilling and Production

Refer also to citation(s) 68, 669, 2804

70 (BNL–49602) **Effects of selected thermophilic microorganisms on crude oils at elevated temperatures and pressures: Quarterly report, April 1, 1993–June 30, 1993.** Premuzic, E.T.; Lin, M.S. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94001770. Source: OSTI; NTIS; GPO Dep.

Biodegradation of Wilmington, CA. crude oil treated with several different microorganisms at two different temperatures was determined. These results show that there is a significant additional recovery of crude oil with thermophilic microorganisms and that variations due to different species also occur under the experimental conditions used in core flooding experiments. Relative to recovery of crude by saline drive additional lighter crude is being recovered by treatment of Wilmington with BNL-NZ-3. These results support the diagnostic significance of chemical markers in predicting efficiency of biochemical treatment.

71 (DOE/BC–92/4) **Contracts for field projects and supporting research on enhanced oil recovery, July–September 1992: Progress review No. 72, quarter ending September 30, 1992.** USDOE Bartlesville Project Office, OK (United States). Sep 1993. 119p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93000129. Source: OSTI; NTIS; GPO Dep.

Accomplishments for the past quarter are presented for the following tasks: Chemical flooding–supporting research; gas displacement–supporting research; thermal recovery–supporting research; geoscience technology; resource assessment technology; microbial technology; and novel technology. A list of available publication is also provided.

72 (DOE/BC/14474–15) **Characterization and modification of fluid conductivity in heterogeneous reservoirs to improve sweep efficiency: [Quarterly report], April 1–June 30, 1993.** Fogler, H.S. Michigan Univ., Ann Arbor, MI (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89BC14474. Order Number DE94001745. Source: OSTI; NTIS; GPO Dep.

Work performed during this quarter was aimed at investigating the behavior of foamed gel using our newly developed model. Three porous medium and gel properties were systematically varied to determine their effect on the foamed gel breakdown process; The pore throat size distribution standard deviation, σ, was varied to investigate the effect of microscopic heterogeneities. Three different rupture pressure relationships (RPR) were used to simulate gels with different yield functionalities. Two different deformation constant relationships (DCR) were used to study gel elasticity. The variance between runs with different properties was adequately revealed using a 10 by 10 network; thus larger networks were avoided and computational effort saved. The pore throat and lens dimensions were assigned to the network via random sampling of a normal distribution. The maximum and minimum bond diameters were the mean bond size, plus or minus three standard deviations, respectively. A mean lens length and standard deviation of $1e^{-4}$ m, and $3e^{-6}$ m, were used in every run. A narrow lens size distribution was used in absence of a relationship between lens length and pore throat diameter. Furthermore, foamed gel heterogeneity could be simulated easily by varying the pore throat size distribution against the narrow lens length distribution. This technical progress report discusses only one of the interesting results found during our modeling investigation, the effect of gel elasticity on foamed gel breakdown.

73 (DOE/BC/14831–4) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Quarterly status report, April 1, 1993–June 30, 1993.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. 30 Jul 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE94001748. Source: OSTI; NTIS; GPO Dep.

Much of the remaining oil offshore is trapped in formations that are extremely complex due to intrusions of salt domes. Conventional seismic processing techniques cannot clearly image either these traps or the full extent of oil-bearing segments near the salt domes; therefore, substantial volumes of oil may have remained uncontacted by previous drilling. Recently, however, significant innovations have been made in seismic processing and mathematical migration of seismic signal. In addition, significant advances have been made in deviated and horizontal drilling technologies and applications. These technology advances make it possible to reprocess existing seismic data to identify non-contacted portions of the reservoirs, which can then be contacted using advanced drilling technologies to kick out new wells from existing wells. Effective application of these technologies, along with improved recovery methods, offers opportunities to significantly increase Gulf of Mexico production, delay platform abandonments, and preserve access to a substantial remaining oil target for enhanced recovery and other advanced recovery processes. During this reporting period, data collection continued from the Minerals Management Service (MMS) and several operators. Modifications to BOAST II and MASTER reservoir simulators for the integration of radial grid systems and for use in simulating miscible gas injection processes in steeply dipping reservoirs continued. The testing of the experimental apparatus designed for studying the recovery of attic oil began. Analysis of data obtained from Taylor Energy in South Marsh 73 field continued.

74 (DOE/BC/14886–3) **Investigation of oil recovery improvement by coupling an interfacial tension agent and a mobility control agent in light oil reservoirs: Technical progress report, April–June 1993.** Pitts, M.J. Surtek, Inc., Golden, CO (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14886. Order Number DE94001746. Source: OSTI; NTIS; GPO Dep.

The study will investigate two major areas concerning coinjecting on interfacial tension reduction agent(s) and a mobility control agent into petroleum reservoirs. The first will consist of defining the mechanisms of interaction of an alkaline agent, a surfactant, and a polymer on a fluid-fluid and fluid-rock basis. The second is the improvement of the economic of the combined technology. This report examines the effect of polymer addition to different combinations of alkaline agents and surfactants. Xanthan gum and polyacrylamide polymers were evaluated. In addition, the effect of alkali and polymer on the critical micelle concentration of different surfactant types was investigated.

75 (DOE/BC/14954–2) **Advanced secondary recovery demonstration for the Sooner Unit: [Quarterly] report, February–April 1993.** Sippel, M.; Junkin, J.; Pritchett, R.; Hardage, B. Research and Engineering Consultants, Inc., New Raymer, CO (United States). 20 May 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14954. Order Number DE94001744. Source: OSTI; NTIS; GPO Dep.

The objectives of the project are to demonstrate the effectiveness of geologically targeted infill drilling and improved reservoir management to obtain maximum oil recovery from the Sooner Unit field using water injection and gas recycling as secondary methods. The first phase of the project involves an integrated multi-discipline approach to identify optimum well sites and development of a reservoir operations plan. The second phase will involve drilling of up to three geologically targeted infill wells and establishing production/injection schedules. Reservoir simulation, transient well tests and careful production monitoring will be used to evaluate the results. The third phase will involve technology transfer through a series of technical papers and presentations of a short course. Emphasis will be on the economics of the project and the implemented technologies.

76 (DOE/MC/11076–3424) **Testing of and model development for double-walled thermal tubular.** Satchwell, R.M.; Johnson, L.A. Jr. Western Research Inst., Laramie, WY (United States). Aug 1992. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE93011301. Source: OSTI; NTIS; GPO Dep.

Insulated tubular products have become essential for use in steam injection projects. In a steam injection project, steam is created at the surface by either steam boilers or generators. During this process, steam travels from a boiler through surface lines to the wellhead, down the wellbore to the sandface, and into the reservoir. For some projects to be an economic success, cost must be reduced and oil recoveries must be increased by reducing heat losses in the wellbore. With reduced heats losses, steam generation costs are lowered and higher quality steam can be injected into the formation. To address this need, work under this project consisted of the design and construction of a thermal flow loop, testing a double-walled tubular product that was manufactured by Inter-Mountain Pipe Company, and the development and verification of a thermal hydraulic numerical simulator for steam injection. Four different experimental configurations of the double-walled pipe were tested. These configurations included: (1) bare pipe case, (2) bare pipe case with an applied annular vacuum, (3) insulated annular pipe case, and (4) insulated annular pipe case with an applied annular vacuum. Both the pipe body and coupling were tested with each configuration. The results of the experimental tests showed that the Inter-Mountain Pipe Company double-walled pipe body achieved a 98 percent reduction in heat loss when insulation was applied to the annular portion of the pipe. The application of insulation to the annular portion of the coupling reduced the heat losses by only 6 percent. In tests that specified the use of a vacuum in the annular portion of the pipe, leaks were detected and the vacuum could not be held.

77 (DOE/MC/26031–12) **Field verification of CO_2-foam: [Quarterly report], April 1–June 30, 1993.** Martin, F.D.; Heller, J.P.; Weiss, W.W. New Mexico Inst. of Mining and Technology, Socorro, NM (United States). New Mexico Petroleum Recovery Research Center. [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-89MC26031. (PRRC–93-24). Order Number DE94001737. Source: OSTI; NTIS; GPO Dep.

This project is a cooperative industry-university-government effort to transfer laboratory research technology to a field demonstration test. The primary objectives of the project is to evaluate the use of foam for mobility control and fluid diversion in a field-scale CO_2 flood. Seven tasks were identified for the completion of this four-year project: (1) evaluate and select and field site, (2) develop an initial site-specific plan, (3) conduct laboratory CO_2-foam mobility test, (4) perform reservoir simulations, (5) design the foam slug, (6) implement a field test, and (7) evaluate results. During this quarter, the results of the first foam test (July to October, 1992) were evaluated, and a second foam test was initiated. A meeting of the Joint Project Advisory Team was held in Socorro on June 30 to July 1, 1993, to review all of the data obtained from the project to date. This report summarizes the most important data and provides a status of the project.

78 (ETDE/JP-mf–94714745, pp. 29-32) **Energy-conservation by utilizing computer that even operating staff could do.** Idemitsu Kosan Co. Ltd., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

In the operation of the plant using the computer by introducing a highly-advanced control technique from abroad, the control logic could not be used due to partial remodelling of the plant. As a result, the operator had to control the plant. Then, an examination was started on whether or not professional operators of the plant can program such control logic by utilizing the DCS (data control system), intending to further save energy. The control of the plant with a highly-advanced program by utilizing the application module of the DCS was planned. In the points where further energy can be saved, 20 thema were isolated. Additionally, a cause and effect diagram was prepared to control the plant with the DCS. Consequently, 110 million yen could be saved without re-import techniques from abroad. Furthermore, the merit by this improvement was estimated to 83 million yen/year. 4 figs.

79 (LBL–34553) **Iterative electromagnetic Born inversion applied to earth conductivity imaging.** Alumbaugh, D.L. Lawrence Berkeley Lab., CA (United States). Aug 1993. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE93040668. Source: OSTI; NTIS; GPO Dep.

This thesis investigates the use of a fast imaging technique to deduce the spatial conductivity distribution in the earth from low frequency (< 1 MHz), cross well electromagnetic (EM) measurements. The theory embodied in this work is the extension of previous strategies and is based on the Born series approximation to solve both the forward and inverse problem. Nonlinear integral equations are employed to derive the series expansion which accounts for the scattered magnetic fields that are generated by inhomogeneities embedded in either a homogenous or a layered earth. A sinusoidally oscillating, vertically oriented magnetic dipole is employed as a source, and it is assumed that the scattering bodies are azimuthally symmetric about the source dipole axis. The use of this model geometry reduces the 3-D vector problem to a more manageable 2-D scalar form. The validity of the cross well EM method is tested by applying the imaging scheme to two sets of field data. Images of the data collected at the Devine, Texas test site show excellent correlation with the well logs. Unfortunately there is a drift error present in the data that limits the accuracy of the results. A more complete set of data collected at the Richmond field station in Richmond, California demonstrates that cross well EM can be successfully employed to monitor the position of an injected mass of salt water. Both the data and the resulting images clearly indicate the plume migrates toward the north-northwest. The

plausibility of these conclusions is verified by applying the imaging code to synthetic data generated by a 3-D sheet model.

80 (NIPER–717) **National Institute for Petroleum and Energy Research monthly progress report for August 1993.** National Inst. for Petroleum and Energy Research, Bartlesville, OK (United States). Sep 1993. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-83FE60149. Order Number DE94000531. Source: OSTI; NTIS; GPO Dep.

Brief progress reports are presented under the following tasks: energy production research; fuels research; and supplemental Government programs. Energy production research includes: reservoir assessment and characterization; TORIS research support; development of improved microbial flooding methods; development of improved chemical flooding methods; development of improved alkaline flooding methods; development of improved alkaline flooding methods; mobility control and sweep improvement in chemical flooding; gas flood performance prediction improvement; mobility control, profile modification, and sweep improvement in gas flooding; three-phase relative permeability research; thermal processes for light oil recovery; thermal processes for heavy oil recovery; and imaging techniques applied to the study of fluids in porous media. Fuels research covers; development of analytical methodology for analysis of heavy crudes; and thermochemistry and thermophysical properties of organic nitrogen- and diheteroatom-containing compounds. Supplemental Government program includes: feasibility study of heavy oil recovery in the Midcontinent region: Oklahoma, Kansas, and Missouri; surfactant-enhanced alkaline flooding field project; process-engineering property measurements on heavy petroleum components; development and application of petroleum production technologies; upgrade PBO crude oil database; simulation analysis of steam-foam projects; DOE education initiative project; technology transfer to independent producers; compilation and analysis of outcrop data from the Muddy and Almond formations; implementation of oil and gas technology transfer initiative; horizontal well production from fractured reservoirs; chemical EOR workshop; and organization of UNITAR 6th International conference of Heavy Crude and Tar Sands.

0206 Health and Safety

81 (ETDE-IT–93-245) **Notes on toxic materials: Carbon monoxide.** Uccelli, R. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Mauro, F.; Federico, A.G. 1992. 18p. (In Italian). Order Number DE94716598. Source: OSTI; NTIS (US Sales Only).

Colourless, odourless and tasteless, carbon monoxide exceeds all the other air pollutants put together in terms of atmospheric concentration ratios. The major source of this gas is gasoline engine exhausts. Produced on the earth's surface, carbon monoxide, in part, migrates into the upper atmosphere where it oxidizes to form carbon dioxide and, in part, it is absorbed by the soil, vegetation and surface waters. This paper correlates EPA (US Environmental Protection Agency) and WHO (World Health Organization) data on urban area carbon monoxide exposure, absorption and human biological effects to make a comparative assessment of recommended limits set by these and Italian environmental protection and health organizations on atmospheric concentrations of carbon monoxide in downtown areas. Particular attention is given to the situation in Rome, Italy, where carbon monoxide levels have very often exceeded threshold levels, especially in winter months. The authors note that a major effort is required to establish effective traffic control given that concentrations of this gas are highly dependent, not only on density of traffic, but also on velocity (emissions are greater at low velocity). Types of gasoline engine combustion and exhaust systems must also be regulated. The use of catalytic converters, for example, can reduce carbon monoxide emissions by as much as 80%.

0207 Economic, Industrial, and Business Aspects

Refer also to citation(s) 148

82 (DOE/EIA–0380(93/10)) **Petroleum marketing monthly, October 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 7 Oct 1993. 189p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001360. Source: OSTI; NTIS; GPO Dep.

The Petroleum Marketing Monthly (PMM) is designed to give information and statistical data about a variety of crude oils and refined petroleum products. The publication provides statistics on crude oil and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase prices, the f.o b. and landed cost of imported crude oil, and the refiners' acquisition cost of crude oil. Sales data for motor gasoline, distillates residuals, aviation fuels, kerosene, and propane are presented.

83 (DOE/EIA–0520(93/08)) **International petroleum statistics report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. 30 Aug 1993. 62p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040830. Source: OSTI; NTIS; GPO; GPO Dep.

This report presents data on international oil production, demand, imports, exports, and stocks. The report has four sections. Section 1 contains time series data on world oil production, and on oil demand and stocks in the Organization for Economic Cooperation and Development (OECD). This section contains annual data beginning in 1980, and monthly data for the most recent two years. Section 2 presents an oil supply/demand balance for world. This balance is presented in quarterly intervals for the most recent two years. Section 3 presents data on oil imports by OECD countries. This section contains annual data for the most recent year, quarterly data for the most recent two quarters, and monthly data for the most recent twelve months. Section 4 presents annual time series data on world oil production and oil stocks, demand, and trade in OECD countries. World oil production and OECD demand data are for the years 1970 through 1992; OECD stocks from 1973 through 1992; and OECD trade from 1982 through 1992.

84 (DOE/EIA–0520(93/09)) **International petroleum statistics report, September 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. 28 Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000756. Source: OSTI; NTIS; GPO Dep.

The International Petroleum Statistics Report presents data on international oil production, demand, imports, exports, and stocks. The report has four sections. Section 1 contains time series data on world oil production, and on oil demand and stocks in the Organization for Economic Cooperation and Development (OECD). This section contains annual data beginning in 1980, and monthly data for the most recent two years. Section 2 presents an oil supply/demand balance for world. This balance is presented in quarterly intervals for the most recent two years. Section 3 presents data on oil imports by OECD countries. This section contains annual data for the most recent year, quarterly data for the most recent two quarters, and monthly data for the most recent twelve months. Section 4 presents annual time series data on world oil production and oil stocks, demand, and trade in OECD countries. World oil production and OECD demand data are for the years 1970 through 1992; OECD stocks from 1973 through 1992; and OECD trade from 1982 through 1992. Data for the United States are developed by the Energy Information Administration (EIA) Office of Oil and Gas. Data for other countries are derived largely from published sources including International Energy Agency publications, the EIA International Energy Annual, and the trade press. (See sources after each section). All data are reviewed by the International Statistics Branch of EIA. All data have been converted to units of measurement familiar to the American public. Definitions of oil production and consumption are consistent with other EIA publications.

85 (DOE/EIA–0538(93/94-1)) **Winter fuels report, week ending October 8, 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 15 Oct 1993. 109p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001363. Source: OSTI; NTIS; GPO; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: Distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

86 (DOE/EIA–0538(93/94-2)) **Winter fuels report, week ending October 15, 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 21 Oct 1993. 94p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001841. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: Distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

87 (DOE/EP/79129–T1) **Economic impacts of oil spills: Spill unit costs for tankers, pipelines, refineries, and offshore facilities: [Task 1, Final report].** Advanced Resources International, Inc., Arlington, VA (United States). 15 Oct 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-93EP79129. Order Number DE94001248. Source: OSTI; NTIS; INIS; GPO Dep.

The impacts of oil spills – ranging from the large, widely publicized Exxon Valdez tanker incident to smaller pipeline and refinery spills – have been costly to both the oil industry and the public. For example, the estimated costs to Exxon of the Valdez tanker spill are on the order of $4 billion, including $2.8 billion (in 1993 dollars) for direct cleanup costs and $1.125 billion (in 1992 dollars) for settlement of damages claims caused by the spill. Application of contingent valuation costs and civil lawsuits pending in the State of Alaska could raise these costs appreciably. Even the costs of the much smaller 1991 oil spill at Texaco's refinery near Anacortes, Washington led to costs of $8 to 9 million. As a result, inexpensive warning, response and remediation technologies could lower oil spin costs, helping both the oil industry, the associated marine industries, and the environment. One means for reducing the impact and costs of oil spills is to undertake research and development on key aspects of the oil spill prevention, warming, and response and remediation systems. To target these funds to their best use, it is important to have sound data on the nature and size of spills, their likely occurrence and their unit costs. This information could then allow scarce R&D dollars to be spent on areas and activities having the largest impact. This report is intended to provide the "unit cost" portion of this crucial information. The report examines the three key components of the US oil supply system, namely, tankers and barges; pipelines and refineries; and offshore production facilities. The specific purpose of the study was to establish the unit costs of oil spills. By manipulating this key information into a larger matrix that includes the size and frequency of occurrence of oil spills, it will be possible to estimate the likely future impacts, costs, and sources of oil spills.

88 (EUR–14636) **Community documentation centre on Industrial risk. Comparison of selected LPG related codes and standards.** Harris, S.; Kemp, P.; Tait, D.; Cerda, H.W. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 147p. Contract 40-19-90-06 ED ISP GB. Source: OSTI; NTIS (US Sales Only).

With this publication the Community Documentation Centre on Industrial Risk (CDCIR) is setting forth the production of comparative review publications. In an earlier report (EUR 13699 EN) LPG related regulations in the Community Member Countries and the U.S.A. have been compared. The comparison is herewith extended to LPG related codes and standards. The first report reviewed the coverage of LPG specific regulations and codes of practice, while the current study compares in greater depth certain key aspects of LPG plant design (pressure vessels, piping, pressure relief valves, hazardous area classification and water spray systems). It examines in more detail the LPG regulations and codes themselves as well as the more general codes and standards applicable also to LPG installations. Existing European codes and standards are compared to each other and to U.S. ones. In view of the wish within the Community to an enhanced harmonization, CEN has already initiated among others the CEN/TC 286 programme aiming to the unified European standardization of all pressure equipment and transport pressure equipment for LPG, including associated accessories. This comparative study clearly identifies priorities for action and it is hoped that it will be a useful tool for authorities, industry and all other bodies and persons working for the safety in handling hazardous substances.

0208 Waste Management

89 (ANL/ESD/TM–52) **Used oil disposal and recycling in the United States.** Karvelas, D.E.; Daniels, E.J. Argonne National Lab., IL (United States). Jul 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000551. Source: OSTI; NTIS; GPO Dep.

Used oil represents an important energy resource, which, if properly managed and reused, could lessen US dependence on imported fuels. About 1.4 million gallons of used oil is generated annually in the United States. Of that total, about 70% is recycled: 57% is used as fuel and 12% is refined. In August 1992, the US Environmental Protection Agency adopted standards for recycling of used oil, and many states also regulate used oil (six states list used oil as hazardous waste). This report reviews the sources of used oil and methods of disposition, focusing on reprocessing and re-refining. About 83% of the recycled used oil is reprocessed for use as fuel. However, concern about the level of lead in such fuel is increasing. Re-refining used oil is an environmentally friendly process that yields higher energy savings than reprocessing; however, it is more capital-intensive. Reprocessing used oil for use as fuel yields an energy savings (over disposal) of 131,130 Btu/gal, while re-refining the oil for reuse as lube oil saves 180,000 Btu/gal, an advantage of 48,870 Btu/gal. However, further research is needed to enhance re- refining and to demonstrate the quality and competitiveness of its products.

90 (DOE/MC/11076–3425) **Treatment of produced waters by electrocoagulation and reverse osmosis.** Tuggle, K.; Humenick, M.; Barker, F. University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst. Aug 1992. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE93011302. Source: OSTI; NTIS; GPO Dep.

Two oil field produced waters and one coal bed methane produced water from Wyoming were treated with electrocoagulation and reverse osmosis. All three produced waters would require treatment to meet the new Wyoming Department of Environmental Quality requirements for effluent discharge into a class III or IV stream. The removal of radium 226 and oil and grease was the primary focus of the study. Radium 226 and oil and grease were removed from the produced waters with electrocoagulation. The best removal of radium 226 (>84%) was achieved with use of a non-sacrificial anode (titanium). The best removal of oil and grease (>93%) was achieved using a sacrificial anode (aluminum). By comparison, reverse osmosis removed up to 87% of the total dissolved solids and up to 95% of the radium 226.

0209 Environmental Aspects

Refer also to citation(s) 87, 1150, 1233, 1234, 1268, 1273, 1320, 1325, 1328, 1332, 1335, 1346, 1350, 1354, 1357, 1364, 1365, 1367, 2058, 2059, 2060, 2061, 2063, 2065, 2066, 2069, 2094, 2548

91 (DOE/EA–0804) **Environmental assessment of the brine pipeline replacement for the Strategic Petroleum Reserve Bryan Mound Facility in Brazoria County, Texas.** USDOE, Washington, DC (United States). Sep 1993. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000979. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has prepared an environmental assessment (EA), DOE/EA-0804, for the proposed replacement of a deteriorated brine disposal pipeline from the Strategic Petroleum Reserve (SPR) Bryan Mound storage facility in Brazoria County, Texas, into the Gulf of Mexico. In addition, the ocean discharge outfall would be moved shoreward by locating the brine diffuser at the end of the pipeline 3.5 miles offshore at a minimum depth of 30 feet. The action would occur in a floodplain and wetlands; therefore, a floodplain/wetlands assessment has been prepared in conjunction with this EA. Based on the analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969 (42 USC. 4321, et seg.). Therefore, the preparation of an Environmental Impact Statement (EIS) is not required, and the Department is issuing this Finding of No Significant Impact (FONSI). This FONSI also includes a Floodplain Statement of Findings in accordance with 10 CFR Part 1022.

92 (LA-SUB–93-274(5/91)) **IOGCC/DOE oil and gas environmental workshop.** Los Alamos National Lab., NM (United States); Interstate Oil and Gas Compact Commission, Oklahoma City, OK (United States). 16 May 1991. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9105430–Summ.: IOGCC/DOE oil and gas environmental workshop, Pittsburgh, PA (United States), 16 May 1991). Order Number DE93040581. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) in cooperation with US Department of Energy (DOE) has developed a workshop format to allow state regulatory officials and industry representatives the opportunity to participate in frank and open discussions on issues of environmental regulatory compliance. The purpose in providing this forum is to assist both groups in identifying the key barriers to the economic recoverability of domestic oil and gas resources while adequately protecting human health and the environment. The following topics were discussed, groundwater protection; temporarily abandoned and idle wells; effluent discharges; storm water runoff; monitoring and compliance; wetlands; naturally occurring radioactive materials; RCRA reauthorization and oil pollution prevention regulation. At the conclusion, all of the participants were asked to complete a questionnaire which critiqued the day activities. A discussion of each of the issues is made a part of this report as is a summary of the critique questionnaire which were received.

93 (LA-SUB–93-274(10/91)) **IOGCC/DOE oil and gas environmental workshop.** Los Alamos National Lab., NM (United States); Interstate Oil and Gas Compact Commission, Oklahoma City, OK (United States). 1991. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9110515–Summ.: IOGCC/DOE oil and gas environmental workshop, Bakersfield, CA (United States), 10-11 Oct 1991). Order Number DE93040582. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) in cooperation with US Department of Energy (DOE) has developed a workshop format to allow state regulatory officials and industry representatives the opportunity to participate in frank and open discussions on issues of environmental regulatory compliance. The purpose of providing this forum is to assist both groups in identifying the key barriers to the economic recoverability of domestic oil and gas resources while adequately protecting human health and the environment. The IOGCC and DOE staff worked with key state and industry representatives to develop a list of appropriate regulatory and industry representatives to be invited to participate. These same industry and regulatory representatives also provided a prioritized list of topics to be discussed at this workshop. After the topic leader set out the issue, views of those present were solicited. In almost every case, both the industry representatives and the regulatory personnel spoke with candor in discussing the problems. Common points of discussion for each topic were: (1) conflicting state and federal regulations; (2) conflicting regulations or permit requirements established by different state agencies; (3) increasing compliance costs; and (4) regulatory constraints that will result in "no net growth" in California oil and gas production and more likely a net decrease. This report contains a copy of the written presentation for each topic as well as a summary of the participants discussion.

0210 Legislation and Regulations

Refer also to citation(s) 148

0220 Transport, Handling, and Storage

Refer also to citation(s) 91, 2058, 2059, 2060, 2061, 2063, 2065, 2066

94 (DOE/FE–0283) **Strategic Petroleum Reserve quarterly report.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Strategic Petroleum Reserve. 15 Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001715. Source: OSTI; NTIS; GPO Dep.

This Quarterly Report highlights activities undertaken during the second quarter of calendar year 1993, including: inventory of petroleum products stored in the Reserve, under contract and in transit at the end of the calendar quarter; fill rate for the current quarter and projected fill rate for the next calendar quarter; average price of the petroleum products acquired during the calendar quarter; current and projected storage capacity and plans to accelerate the acquisition or construction of such capacity; analysis of existing or anticipated problems with the acquisition and storage of petroleum products, and future expansion of storage capacity; funds obligated by the Secretary from the SPR Petroleum Account and the Strategic Petroleum Reserve Account during the prior calendar quarter and in total; and major environmental actions completed, in progress, or anticipated.

95 (SAND–92-2284) **Strategic Petroleum Reserve (SPR) additional geologic site characterization studies, Bayou Choctaw salt dome, Louisiana.** Neal, J.T. (Sandia National Labs., Albuquerque, NM (United States)); Magorian, T.R.; Byrne, K.O.; Denzler, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001731. Source: OSTI; NTIS; GPO Dep.

This report revises and updates the geologic site characterization report that was published in 1980. Revised structure maps and sections show interpretative differences in the dome shape and caprock structural contours, especially a major east-west trending shear zone, not mapped in the 1980 report. Excessive gas influx in Caverns 18 and 20 may be associated with this shear zone. Subsidence values at Bayou Choctaw are among the lowest in the SPR system, averaging only about 10 mm/yr but measurement and interpretation issues persist, as observed values often approximate measurement accuracy. Periodic, temporary flooding is a continuing concern because of the low site elevation (less than 10 ft), and this may intensify as future subsidence lowers the surface even further. Cavern 4 was re-sonared in 1992 and the profiles suggest that significant change has not occurred since 1980, thereby reducing the uncertainty of possible overburden collapse – as occurred at Cavern 7 in 1954. Other potential integrity issues persist, such as the proximity of Cavern 20 to the dome edge, and the narrow web separating Caverns 15 and 17. Injection wells have been used for the disposal of brine but have been only marginally effective thus far; recompletions into more permeable lower Pleistocene gravels may be a practical way of increasing injection capacity and

brinefield efficiency. Cavern storage space is limited on this already crowded dome, but 15 MMBBL could be gained by enlarging Cavern 19 and by constructing a new cavern beneath and slightly north of abandoned Cavern 13. Environmental issues center on the low site elevation: the backswamp environment combined with the potential for periodic flooding create conditions that will require continuing surveillance.

0250 Combustion

Refer also to citation(s) 46, 47, 656

96 (BNL–52392) **Proceedings of the 1993 oil heat technology conference and workshop.** McDonald, R.J. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 195p. Sponsored by USDOE, Washington, DC (United States); Petroleum Marketers Association of America, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). Order Number DE94001379. Source: OSTI; NTIS; GPO Dep.

This report documents the proceedings of the 1993 Oil Heat Technology Conference and Workshop, held on March 25–26 at Brookhaven National Laboratory (BNL), and sponsored by the US Department of Energy - Office of Building Technologies (DOE-OBT), in cooperation with the Petroleum Marketers Association of America. This Conference, which was the seventh held since 1984, is a key technology-transfer activity supported by the ongoing Combustion Equipment Technology (Oil-Heat R&D) program at BNL, and is aimed at providing a forum for the exchange of information among international researchers, engineers, manufacturers, and marketers of oil-fired space- conditioning equipment. Selected papers have been processed separately for inclusion in the Energy Science and Technology Database.

03 NATURAL GAS

97 (NUTEK-VK–93-14) **Including natural gas in the hydro-thermal energy balance for evaluation with multiple objectives and uncertainties.** Skugge, G. (Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electric Power Systems). Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 1993. 156p. Project NUTEK-616-038. Order Number DE94709784. Source: OSTI; NTIS.

This thesis deals with the planning problem of integrating natural gas in the electric power system. It is assumed that no domestic natural gas resources exist so that all natural gas needed is imported. The energy balance is formulated including natural gas units with contractual constraints on the import of natural gas. A solution approach is developed which finds an optimal operation plan for all units in the system over the year. In the approach, a reference year is analysed in order to determine a best mix of production resources. This problem, the static generation mix problem, is solved with several objectives and uncertainties. The energy balance is solved by decomposing the problem into two subproblems. One subproblem concerns the scheduling of hydro and non-gas thermal units. The other tackles the problem of finding an optional production schedule for natural gas units. The scheduling of hydro and non-gas thermal units is performed according to the water value technique where the schedule for natural gas units is given. The schedule of natural gas units is obtained through the solution of a quadratic programming problem with marginal costs from the hydro-thermal schedule. It is shown how the output from the energy balance can be used when solving the static generation mix problem through a multi-objective trade-off analysis of different plans for a future design of the production system. The trade-off analysis is performed while taking into account possible outcomers of uncertain variables. 74 refs, 42 figs, 18 tabs

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 101, 1664

98 (DOE/ER/61010–T11) **Sampling the marine gas-hydrate reservoir: Assessing the methane inventory, internal dynamics, and potential of methane discharges to the atmosphere: Final progress report.** Paull, C. (North Carolina Univ., Chapel Hill, NC (United States)). California Univ., Davis, CA (United States). 27 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC03-90ER61010. Order Number DE93040797. Source: OSTI; NTIS; GPO Dep.

The status of the pore water and sediment core analysis of the surface sediments that overlie a major gas-hydrate field on the Carolina Continental Rise and Blake Ridge is reported here. Funding from NIGEC's southern regional center provided support for a cruise of the RV Cape Hatteras in September 1992 (CH-11-92) on which 20 piston cores were taken. However, over the last 18 months we have had the opportunity to collect an additional 35 piston cores in this region, in part through the assistance of another DOE funded project that is being run by the USGS. At this date, we have pore water data from 55 piston cores which gives us both a regional and a site-specific insight into the processes in this region. It is our intention to combine the results of all these cores to arrive at a unified understanding of the processes acting on the continental margin which influence gas-hydrate formation and distribution. Some of the highlights of this work and some of accomplishments of this project to-date are outlined.

99 (DOE/MC/28087–3464) **Integrated seismic study of naturally fractured tight gas reservoirs: Technical progress report, January 1, 1993–March 31, 1993.** Mavko, G.; Nur, A. Stanford Univ., CA (United States). Dept. of Geophysics. 26 Apr 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-91MC28087. Order Number DE94001311. Source: OSTI; NTIS; GPO Dep.

During this quarter we (1) received the last of the field tapes and survey information for the seismic field data acquisition which was finished at the very end of the previous quarter, (2) began the large task of processing the seismic data, (3) collected well logs and other information to aid in the interpretation, and (4) initiated some seismic modeling studies. As already reported, the field data acquisition was at Amoco's Powder River Basin site in southeast Wyoming. This is a low permeability fractured site, with both gas and oil present. The reservoir is highly compartmentalized, due to the low permeability, with the fractures providing the only practical drainage paths for production. The two formations of interest are: The Niobrara: a fractured shale and limey shale to chalk, which is a reservoir rock, but also its own source rock. The Frontier: a tight sandstone lying directly below the Niobrara, brought into contact with it by an unconformity. The fractures are thought to lie in a roughly northwest-southeast trend, along the strike of a flexure, which forms one of the boundaries of the basin.

100 (SAND–93-1342) **Rationale for finding and exploiting fractured reservoirs, based on the MWX/SHCT-Piceance basin experience.** Lorenz, J.C.; Warpinski, N.R.; Teufel, L.W. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000655. Source: OSTI; NTIS; GPO Dep.

The deliverability of a reservoir depends primarily on its permeability, which, in many reservoirs, is controlled by a combination of natural fractures and the in situ stresses. Therefore it is important to be able to predict which parts of a basin are most likely to contain naturally fractured strata, what the characteristics of those fractures might be, and what the most likely in situ stresses are at a given location. This paper presents a set of geologic criteria that can be superimposed onto factors, such as levels of maturation and porosity development, in order to predict whether fractures are present once the likelihood of petroleum presence and reservoir development have been determined. Stress causes fracturing, but stresses are not permanent. A natural-fracture permeability pathway opened by one system of stresses may be held open by those stresses, or narrowed or even closed by changes of the stress to an oblique or normal orientation. The origin of stresses and stress anisotropies in a basin, the potential for stress to create natural fractures, and the causes of stress reorientation are examined in

this paper. The appendices to this paper present specific techniques for exploiting and characterizing natural fractures, for measuring the present-day in situ stresses, and for reconstructing a computerized stress history for a basin.

0303 Drilling, Production, and Processing

Refer also to citation(s) 38, 100

101 (DOE/MC/28176–3455) **The Atlas of Major Appalachian Basin Gas Plays: Data collection and compilation.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Jan 1993. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28176. Order Number DE93011304. Source: OSTI; NTIS; GPO Dep.

Task 2 of the "Atlas of Major Appalachian Basin Gas Plays" a is the data collection and compilation phase of the project. The prime objective is to collect information by pool, i.e., producing reservoir within a field, that will provide (1) basic reservoir data, (2) reservoir parameters, (3) fluid and gas properties, and (4) volumetric data. It is imperative that all data elements be well understood by all participants to facilitate this process. This report presents an overview of data collection topics. Three families of data that be part of this project: (1) the data base of pool information, (2) drawings, charts, and maps, and (3) text data, including bibliographic information. An initial data definition will be presented with an emphasis on the data base of basic information by pool. Because of the direct bearing on Task 2 of the project and the development of a data base as a deliverable product, this report will concentrate mainly on data definition and collection. A basic data collection strategy is included.

102 (SAND–93-7041) **Development of stimulation diagnostic technology: Annual report, January 1991–December 1992.** Warpinski, N.R. (Sandia National Labs., Albuquerque, NM (United States)); Lorenz, J.C.; Sleefe, G.E.; Engler, B.P. Sandia National Labs., Albuquerque, NM (United States); Gas Research Inst., Chicago, IL (United States). Feb 1993. 111p. Sponsored by Gas Research Inst., Chicago, IL (United States). DOE Contract AC04-94AL85000. (GRI–93/0119). Order Number DE94001680. Source: OSTI; NTIS; GPO Dep.

To apply Sandia's expertise and technology towards the development of stimulation diagnostic technology in the areas of in situ stress, natural fracturing, stimulation processes and instrumentation systems. The approach to stimulation diagnostics is to integrate in situ stress measurements (including microfracs, anelastic strain recovery, circumferential velocity analysis, and coring-induced fractures) with natural fracture characterization, stimulation analyses (including Fracpro, other models, finite-element analyses, and various pressure analyses), and fracture diagnostics in order to validate hydraulic fracture concepts, models and diagnostic capabilities. The focus of this year's efforts has been on the planning and development of the M-Site experiment facility for hydraulic fracture diagnostic development. A microseismic suitability test was conducted at the site with very positive results. In four small fracture treatments, over 1,000 microseismic were recorded, with most of these events having analyzable polarization and p- and s-wave arrivals. In the area of in situ stress, comparative studies are being made to evaluate stress measurement techniques, and an in situ stress topical report is being prepared. Natural fracture studies of the Frontier formation are progressing; the genesis and stratigraphic controls on two fracture sets have been hypothesized.

0305 Health and Safety

Refer also to citation(s) 155

0306 Economic, Industrial, and Business Aspects

Refer also to citation(s) 85, 86, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155

103 (ANL/EAIS/TM–104) **Mexican demand for US natural gas.** Kanter, M.A.; Kier, P.H. Argonne National Lab., IL (United States). Environmental Assessment and Information Sciences Div. Sep 1993. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000906. Source: OSTI; NTIS; INIS; GPO Dep.

This study describes the Mexican natural gas industry as it exists today and the factors that have shaped the evolution of the industry in the past or that are expected to influence its progress; it also projects production and use of natural gas and estimates the market for exports of natural gas from the United States to Mexico. The study looks ahead to two periods, a near term (1993–1995) and an intermediate term (1996–2000). The bases for estimates under two scenarios are described. Under the conservative scenario, exports of natural gas from the United States would decrease from the 1992 level of 250 million cubic feet per day (MMCF/d), would return to that level by 1995, and would reach about 980 MMCF/D by 2000. Under the more optimistic scenario, exports would decrease in 1993 and would recover and rise to about 360 MMCF/D in 1995 and to 1,920 MMCF/D in 2000.

104 (CONF-930495–, pp. 23-26) **Outline of comments.** Ellsworth, B.B. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

An outline of the comments presents by Bruce B. Ellsworth, Commissioner of the New Hampshire Public Utilities Commission is presented. Comments on the following subjects are presented: New England perspective, communications opportunities, industry status, market opportunities, rationale for accepting FERC Order 636, small company purchasing practices, gas research, regulatory focus, pipeline safety, and respect for industry.

105 (CONF-930495–, pp. 27-37) **Acting assistant secretary for policy Department of Energy.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Remarks presented by the Department of Energy's Acting Assistant Secretary for policy are given. The remarks focused on the problems, obstacles, barriers, and the incredibly complex system that has been created to bring natural gas from the wellhead to the barrier tip. The perceptions and reality in the natural gas market have changed. These changes are discussed.

106 (CONF-930495–, pp. 64-75) **Reflections about state policies in a post-order 636/Energy Policy Act era.** Heintz, F.O. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The dinosaur syndrome is discussed. The dinosaurs were three American companies which were very successful in the 1970s but turned into big losers in the 1990s. The dinosaurs are IBM, Sears, General Motors. The three companies didn't respond to significant changes in their environment. They failed to understand the increasingly competitive market in which they were operating. They failed to take into account changes in technology and customer's needs and preferences. They hung on to the old modes too long and were overtaken and overwhelmed by the new. The gas industry is in the midst of a paradigm shift or sea change from regulation to competition. Therefore, the following rhetorical question is appropriate: Are there dinosaurs, or emerging dinosaurs, among us? For example, are there producers who have not positioned themselves to survive through widely fluctuating commodity prices? Are there pipelines wistfully recalling the glory days of bundled merchant sales? Are there local distribution companies operating under the misperception that their franchise protects them from

competition? Are there state regulators who believe that past regulatory policies and procedures will be suitable for the 1990s? If the answer to any of the questions is "yes", then beware of the dinosaur syndrome. The effect of the dinosaur syndrom on the natural gas syndrome is discussed.

107 (CONF-930495–, pp. 76-85) **NARUC-DOE second national conference on natural gas use.** Reeves, M.S. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A slide presentation was given by Michael S. Reeves of the Peoples Energy Corporation. The following topics were discussed: A description of the markets, importance of commercial markets to companies, competitive barriers, district heating, meeting the challenges, and future outlook. Future planning should include: identifying customer needs, knowing the customers, promoting non-traditional markets, and supporting natural gas in the Clean Air Act Amendments.

108 (CONF-930495–, pp. 86-95) **Commercial gas cooling market.** Itteilag, R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The use of natural gas in commercial air conditioning systems is outlined. Some facts on commercial natural gas cooling are given, and the following subjects are discussed: economic tradeoffs, peak shaving operating strategy, absorption and centrifugal system efficiencies, chiller costs as a function of capacity and energy efficiency versus energy cost. It is concluded that the principle advantage of gas cooling is the avoidance of expensive electric demand charges. Other advantages of gas cooling are the capital cost differential-economies of sale favor larger systems, and the hourly operating cost is less important to overall economics.

109 (CONF-930495–, pp. 96-101) **Commercial markets.** Lee, J.R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Commercial markets for natural gas are discussed by James R. Lee of Columbia Gas Distribution Companies. The presentation focused on FERC Order 636 and its impact on gas purchasing strategies, implications of gas transportation service for commercial customers, and Local Distribution Company (LDC) merchant function/obligation to serve. Conclusions and recommendations are given.

110 (CONF-930495–, pp. 102-103) **Fundamentals of utility gas-acquisition strategy for the 1990s (in 600 words or less).** Tussing, A.R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The reliability of gas supply required by gas-distribution utilities and electric utilities on behalf of their essential-service (core) ratepayers is reliability at the point of delivery. This kind of reliability is not for sale in the field at any price, but depends on control over firm transmission and storage capacity, and/or over gas flows that can be readily interrupted or diverted, or on the existence of markets that offer assured access at a price to these elements of supply. Such markets firmly entrenched themselves for the natural-gas commodity during the 1980s, and are now emerging rapidly for transmission and storage services. There will seldom be any reason for utilities to pay producers a contractual premium for "firmness" of gas supply at the point of production. In the new open-architecture gas market, there will be an infinitely diverse range of elements from which utilities can choose in assembling a gas-supply portfolio. The utilities will henceforth be accountable to the ratepayers and the community through their respective utility commissions for both the strategies chosen and their performance in terms of gas costs and supply reliability.

111 (CONF-930495–, pp. 104-105) **A third-party summary of ARTA views on LDC gas-procurement and its regulatory surveillance.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Fulfillment of FERC's Order 636 requirements will invite consideration of the need to apply the principles of open and workable competition at the retail level. In June 1992, the National Regulatory Research Institute (NRRI) invited such consideration by publishing Occasional Paper No. 15, State Regulatory Challenges for the Natural Gas Industry in the 1990s and Beyond, by David B. Hatcher and Arlon R. Tussing. NRRI returned to this subject in its September 1992 Quarterly Bulletin with a research paper entitled "Pipeline Gas Service Comparability Rule: What Can State Regulators Do Now?" by Daniel J. Duann and David B. Hatcher. These studies bring perspective and controversy to the last stage in connecting the completion fostered by the FERC and others to the ultimate consumers of the natural gas industry. It lists what the authors view as the four critical elements of the natural gas industry today. These elements are: commodity sales are competitive and need not be regulated; most large-volume customers are noncaptive and service to them cannot be regulated the same as service to small-volume customers; spot markets for gas are effective and make reliance on supply contracts unnecessarily. Historically, gas contracts have not proven enforceable in extreme conditions (i.e., just when they are most needed); and restricting resale of transportation service is harmful.

112 (CONF-930495–, pp. 106) **A 1990s commissioner views the role of long-term contracts in utility gas procurement.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Long-term contracts for utility gas procurement avoid transactional costs when contrasted with the alternative of reconstructing every thirty days on the spot market. Some of the benefits, such as avoided transactional costs, work in favor of both the buyer and seller. Others confer an essentially unilateral advantage. From the buyer's perspective, the knowledge that a certain volume of gas is obligated under contract relieves a major uncertainty and provides price planning stability. If the purchaser is a utility, such an arrangement obviates the incurrence of storage costs which represent an alternative means of meeting the Commission's insistence that gas supplies for the core be secure. A proposed Commission policy on long-term gas procurement is outlined. General policy goals are discussed.

113 (CONF-930495–, pp. 107-115) **Balancing competition and regulation in the 90s.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A slide presentation is given that discusses methods for balancing competition and regulation in the 1990s. It is suggested that the only workable response to the increasing competition in the marketplace provided by FERC Order 636 is to lighten state regulation and let the marketplace work. It is concluded that more changes are needed in response to Order 636 but the industry is not sure what they are. Four specific recommendations are presented for coping with these changes.

114 (CONF-930495–, pp. 116) **Presentation outline DOE/NARUC national conference on natural gas use.** Buckley, P.S. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A brief outline is presented of the state commission review of local distribution company (LDC) acquisition and planning decisions. The outline contains an overview, a discussion of Order 636 development/specifics, and integrated resource planning techniques.

115 (CONF-930495–, pp. 117-120) **"PUC review of supply management".** Furbacher, S.A. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A time of significant transition for the natural gas industry, with FERC Order 636 changing the way business will be conducted and spreading the risk across all segments of the value delivery chain, is discussed. And, that includes the end use markets. At the same time, FERC Order 636 is creating significant opportunity for everyone from producer to end use markets. Many are changing the role that must be played. It can be a positive and rewarding experience or it can be traumatic - each will have to make the choice as to which it will be. Finally, this topic is extremely important because it's vitally important to the customers – the millions of natural gas users across the country. A framework for Local Distribution Companies (LDC's) and Public Utility Commissions (PUC's) to use in making decisions about natural gas supply. This framework is based on experience in doing the same thing for corporate facilities. A producer's view of the PUC role in today's natural gas business is described.

116 (CONF-930495–, pp. 121-124) **Oversight of regulated utilities' fuel supply contracts: Achieving maximum benefit from competitive natural gas and emission allowance markets.** Jaffe, A.B.; Kalt, J.P. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

An ongoing trend toward deregulation and reliance on competitive markets is challenging and changing the traditional roles of the Public Utility Commissions (PUCs) that regulate the nation's local gas and electric utilities. When regulated utilities under PUCs' jurisdiction purchase major inputs in new created, or at least newly freed markets, how can regulators ensure that the utilities do so in a way that is in the best interests of the ratepayers? It has been argued by some that the existence or potential existence of public "spot" markets for commodities such as natural gas and pollution emission "allowances" offers an easy solution to this problem: simply require utilities to purchase these commodities in the spot market, or, alternatively, permit them to purchase as they choose but allow them to recover in rates only the current spot price. Proposals of this type are based on a fundamental misunderstanding of how competitive markets operate, and of the potential they hold for improving the performance of the gas and electric industries. The implementation of such "spot only" standards with respect to gas purchase decisions by Local Distribution Companies (LDCs) and electric utilities, as well as utility trades governing emission allowances under the 1990 Clean Air Act Amendments, will stunt the healthy development of gas and emission allowance markets, raise costs to ratepayers, discourage the expansion of the nation's use of natural gas, and undermine the important national experiment with the use of emissions trading to minimize the cost of air pollution control. Methods for obtaining the maximum benefit from competitive natural gas and emission allowance markets are discussed.

117 (CONF-930495–, pp. 125-166) **Government natural gas vehicle initiatives: Paving the way.** Cannon, J.S. (New Mexico Energy, Santa Fe, NM (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Driven by environmental and energy security concerns, the USA has embarked on a major program to replace petroleum fuels in the transportation sector with cleaner-burning alternatives such as natural gas. Since 1989, about 30 of the 50 state governments have enacted programs to promote or require use of alternative transportation fuels. At the federal government level, provisions of the 1990 Clean Air Act Amendments and the 1992 National Energy Policy Act establish broad alternative transportation fuel use initiatives, including a clean-fuel use mandate applicable in 150 cities. The Clinton Administration has repeatedly advocated increased use of natural gas vehicle technology. The Department of Energy has drafted a Presidential Executive Order which requires the federal government to purchase at least 20,000 alternate-fueled vehicles beginning in 1994 for use throughout the country. State and federal government programs already in place in the USA will create a market for more than 1.0 million alternative fuel vehicles this decade. Many, if not most, of these vehicles will be powered by natural gas. This paper will discuss four types of state and federal government programs which are currently in widespread use to require or encourage use of alternative transportation fuels. These policy arenas are: Vehicle conversion mandates; Financial incentives; Regulation of alternate fueled vehicles, including rate-setting policies of state utility commissions; Task forces and committee studies. The attached table provides a matrix of state government activities in these four areas. The matrix will be discussed during the presentation.

118 (CONF-930495–, pp. 167-169) **"Risk and reward in natural gas".** Terzic, B. (Federal Energy Regulatory Commission, New Orleans, LA (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

One result of recent developments in the natural gas industry, from developments in both regulatory initiatives and changing business circumstances, is a re-evaluation of the risks and rewards of the various "business services" offered by both pipelines and local gas distribution companies (LDC). Traditional public utility regulation has implicated an overall risk in terms of risk of return of capital (depreciation over economic life and prudence reviews) and the risk of return on capital. One point to be made is that, unbundling, technology, regulation and markets all are splitting the traditional businesses into multiple services. Some of these services are today offered by more than one provider in some markets, and other services may soon be offered competitively. This leads to a question, not infrequently found in utility regulation, of how to treat monopoly and competitive services offered by the same physical and business entity. The separation of gas supply from gas transportation at the interstate pipeline level has enabled the pipeline company to move risk of future gas supply issues from direct FERC regulation. There is, indeed, still the formidable pipeline by pipeline issue of

"transition cost" associated with prior gas acquisitions under FERC regulation. The customers of pipelines will now take the risk of (and benefit from the rewards of) gas supply acquisition.

119 (CONF-930495–, pp. 170-176) **DOE/NARUC national conference on natural gas use.** Baldwin, R.G. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Financial dimensions to changing regulation and markets are discussed from the standpoint of Natural Gas Partners (NGP), an upstream investor/lender. NPG is active in three financing arenas: (1) provision of venture capital and/or magazine financing to unregulated gas regulated projects; (2) temporary investment of cash in publicly traded energy stacks and bonds; and (3) raising new equity capital and negotiating credit lines. This discussion of changing regulations and markets is divided into three parts: (1) Order 636 and state Public Utility Commission (PUC) power extension, (2) NGP investment areas and how each is affected directly or indirectly by regulation, and (3) speculation on the future outlook for natural gas.

120 (CONF-930495–, pp. 194-203) **IRP, fuel switching, and demand side management DOE/NARUC national conference on natural gas use.** Ridgley, R.L. (Northwest Natural Gas Company, Portland, OR (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Integrated resource planning (IRP), fuel switching, and demand side management as each of these topics apply to operations at Northwest Natural Gas Company, (NNGC), are discussed. NNGC has 360,000 customers in Oregon and Washington. NNGC's utility commissions require of the company to implement integrated resource planning, or at least cost planning, in 1989. The first plan was successfully completed in both states in 1991 and the second one is being worked on. Secondly, cost-effective demand side management is required by each state's IRP rules so more aggressive conservation programs are being developed. Finally, Oregon formally investigated the economics of fuel switching and endorsed the idea in 1991. This was a direct result of requiring both gas and electric utilities to do IRP's.

121 (CONF-930495–, pp. 204-257) **DOE/NARUC national conference on natural gas use.** Smith, L.L. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A slide presentation is given that discusses background and overview of the national petroleum council's study on natural gas. A comprehensive analysis of the potential for natural gas to make a larger contribution to our nation's energy supply and environmental goals; and the potential barriers that could impede the deliverability of gas to the most economic, efficient and environmentally sound end-uses; are discussed. It is reported that natural gas has the potential make a significantly larger contribution, both to the nation's energy supply and its environmental goals. Achieving that potential will require positive actions by both industry and federal, state and local officials.

122 (CONF-930495–, pp. 258-260) **DOE/NARUC national conference on natural gas use.** Kretschmer, R.K. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A panel discussion is presented in order to help understand capacity contracting as mandated by FERC Order 636. Contracting for both new capacity and for resale is discussed. The effects of various FERC orders on deregulation of the natural gas industry, transportation of third party gas, pricing structure for "vintage" gas, purchased gas cost recovery, abandonment of gas sales, the allowable relationship between a pipeline as a merchant and a pipeline as a transporter, and the take or pay orders.

123 (CONF-930495–, pp. 330-347) **Remarks of Paul R. Zielinski.** Zielinski, P.R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

For the past six years, Rochester Telephone Corporation has been operating under some form of incentive regulation. Experience suggests that the basic goals of incentive regulation are achievable. It does end the cost-plus mentality of traditional rate-of-return regulation; rewards efficiency; encourages appropriate investing; and permits ratepayers to share in the benefits the new incentives create. As a next step, the establishment of an even more dramatic competitive regulatory scheme is proposed. The major provisions of the Incentive Plan and the rationale behind it are discussed.

124 (CONF-930495–, pp. 486-498) **Larry Hall, President and COO K N Energy, Inc.** Hall, L. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A slide presentation was given covering the following topics: (1) critical time for natural gas industry; (2) opportunities and benefits from significant domestic energy sources and environmentally clean fuels; (3) challenge or industry, marketplace, and government to work together; (4) upstream issues in this new environment; (5) gathering and processing issues; (6) past 636-regulated unbundled/unregulated-FERC string; (7) supply; (8) first drilling activity; (9) second productive capacity of dry gas barely exceeds output for 1993; (10) storage; (11) prices; (12) traditional regulations won't work; (13) states; and (14) monitoring and oversight to prevent abuses.

125 (CONF-930495–, pp. 499-526) **"New horizons for energy-efficiency: Natural gas cooling".** Jones, D.R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Today's natural gas cooling equipment is better and more efficient than the equipment sold 15 or 20 years ago. Sophisticated controls, added heat recovery, new construction materials and improved manufacturing quality control-all of those things have boosted the competitiveness of these products. An example of the more efficient cooling equipment is the new direct-fired, double-effect absorption chiller than Trane, York and Snyder General are now selling. These chillers have coefficients of performance more than double those of old single-effect units. In addition, today's equipment can provide both heating and cooling. As a result, gas cooling offers particularly good value in hospitals, hotels, restaurants and a variety of other commercial and industrial applications. There are a number of new products on the horizon. For example, the triple effect absorption chiller developed by the Department of

Energy that increases efficiencies by an additional 40 percent. The advantages of the new gas cooling equipment are discussed.

126 (CONF-930495–, pp. 527-529) **Service to residential markets.** Lemon, R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The major issues regarding residential natural gas service at the state level include the extent by which Local Gas Distribution Companies (LDC) services should be unbundled, rate design/cost allocation among customer classes and the terms of service, and the proper incentives for the regulated utility in an environment where there exists considerably more choices. These three issues are interrelated. The issue of whether unbundling should start at the residential customers' burner-tip is discussed.

127 (CONF-930495–, pp. 530-540) **What is the real federal policy for residential natural gas use.** Samuels, M.A. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A panel is discussion is presented on residential gas markets and their potential in the new competitive world of natural gas. Local Gas Distribution Companies (LDCs) continually reassure us that residential consumers are an important market. Certainly LDCs are devoting a major share of their resources to serving residentials. In part this is involuntary; as more and more larger gas users switch to transportation of gas, residential users constitute an ever greater portion of the LDCs's sales. However, LDCs are about the only ones supporting residential concerns. The residential market is multifaceted just like other markets. A variety of responses to its needs are appropriate. Some residential consumers will want choices; some will not. Some will buy gas air conditioners – some may even buy natural gas-fueled vehicles. There is need for greater demand side management and conservation to reduce peak use. There is also potential for expanded gas use, particularly in natural gas air conditioning. However, the current regulatory efforts to shift costs of every description to captive firm customers is not the best way to promote natural gas use by residential consumers.

128 (CONF-930495–, pp. 541-545) **Designing purchased gas adjustment clauses to provide for incentive compatibility in a more competitive environment.** Burns, R.E. (National Regulatory Research Institute, Columbus, OH (United States)); Eifert, M. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Traditionally, automatic adjustment clauses have been generally accepted as a part of a utilities' tariffs for three primary reasons. First, the items generally constitute a significant or large component of the utility's total operating cost. Second, their costs, whether it be gas, coal, labor cost, interest, or other costs, changes in volatile and unpredictable ways. Third, the price of purchased items (commonly fuel or purchased power) was considered entirely outside of the utility's control. Recently, the issue has been raised as to whether these assumptions are still valid. Clearly, fuel and purchased gas costs, while generally down from previous peak levels, still constitute a significant portion of a utility's operating costs. However, an argument might be made as to whether fuel costs have remained volatile and unpredictable. Casual observation seems to suggest less price volatility than in years past. But, can we expect this relative calm of recent years to continue? The answer is probably not. An increase in the volatility of gas and coal prices can be expected in large part because of the Clean Air Act Amendments of 1990. The United States Energy Information Administration predicts a heavy reliance on gas, nonutility generation (usually gas-fired), and low-sulfur coal for future generation. This increased reliance on gas should have a profound effect on purchased-gas adjustment clauses. The design of purchased gas adjustment clauses to provide for incentive compatibility in a more competitive environment is discussed.

129 (CONF-930495–, pp. 546-560) **Natural gas distribution costs and efficiency implications for regulation.** Barcella, M.L. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The results of a comprehensive economic analysis of natural gas distribution costs are presented. The analysis was based on data from fifty local gas distribution companies covering the period 1969-1988. It shows how total costs of gas distribution are related to the types of markets served and to the prices of gas, labor and capital purchased by the companies. The methodology has a broad application. It can be structures to evaluate the cost impacts of different load structures and can derive specific cost estimates for any actual or hypothetical firm. It can be used to estimate the marginal and stand-alone costs of service, to evaluate the cost impacts of load loss or gain, and to measure the relative cost efficiencies of individual firms. The major findings of the study are presented and discussed.

130 (CONF-930495–, pp. 561-566) **Remarks by William F. Whitsitt.** Whitsitt, W.F. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

It is essential to work together is natural gas is to fulfill its potential to meet America's energy needs as an environmentally preferable, abundant and domestically produced fuel. Because natural gas is such an environmentally beneficial fuel it is of growing interest to state regulators, who must take into consideration the environmental consequences of the fuels used by utilities they regulate. Two state initiatives that can promote the use of natural gas are discussed. These are: seasonal burning of gas to control ozone; and encouraging new electric utilities to burn more natural gas to decrease overall pollution. Some of the environmental realities of natural gas production are reviewed.

131 (CONF-930495–, pp. 592-611) **Industrial markets: What your customers really think of the gas industry.** Smith, M.G. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The use of natural gas in electric power generation is discussed. The advantages of using natural gas in power generation are environmental (reduces sulfur dioxide, nitrogen oxides, and carbon dioxide emissions) and economic (produces power cheaper and more reliably than any alternative fuel). The disadvantages of using natural gas as a boiler fuel are: (1) difficulty in attaining long-term contracts; (2) reliance on spot-markets also problematic; (3) curtailments; (4) insufficient pipeline capacity; and (5) day-to-day operational concerns. Methods for responding to these concerns are presented.

132 (CONF-930495–, pp. 612-637) **Remarks to the DOE/NARUC conference on natural gas in the post-order 636/EPACT environment.** Makowski, J. (J. Makowski Associates, Inc., Boston, MA (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use:

state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Ways to remove barriers to the efficient use of natural gas are explored. Two summary observations are made. First, natural gas is clearly the fuel of choice among a majority of non-utility generators. Second, virtually every projection shows that power generation is the single largest potential new market for natural gas in North America. Today, suppliers are organizing themselves to serve this market. Methods by which suppliers intend to serve this market are discussed.

133 (DOE/EIA–0130(93/09)) **Natural gas monthly, September 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 27 Sep 1993. 117p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000664. Source: OSTI; NTIS; GPO; GPO Dep.

The Natural Gas Monthly (NGM) is prepared in the Data Operations Branch of the Reserves and Natural Gas Division, Office of Oil and Gas, Energy Information Administration (EIA), US Department of Energy (DOE). The NGM highlights activities, events, and analyses of interest to public and private sector organizations associated with the natural gas industry. Volume and price data are presented each month for natural gas production, distribution, consumption, and interstate pipeline activities. Producer-related activities and underground storage data are also reported. From time to time, the NGM features articles designed to assist readers in using and interpreting natural gas information.

134 (DOE/EIA–TR-0574) **US production of natural gas from tight reservoirs.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 18 Oct 1993. 31p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001840. Source: OSTI; NTIS; GPO; INIS; GPO Dep.

For the purposes of this report, tight gas reservoirs are defined as those that meet the Federal Energy Regulatory Commission's (FERC) definition of tight. They are generally characterized by an average reservoir rock permeability to gas of 0.1 millidarcy or less and, absent artificial stimulation of production, by production rates that do not exceed 5 barrels of oil per day and certain specified daily volumes of gas which increase with the depth of the reservoir. All of the statistics presented in this report pertain to wells that have been classified, from 1978 through 1991, as tight according to the FERC; i.e., they are "legally tight" reservoirs. Additional production from "geologically tight" reservoirs that have not been classified tight according to the FERC rules has been excluded. This category includes all producing wells drilled into legally designated tight gas reservoirs prior to 1978 and all producing wells drilled into physically tight gas reservoirs that have not been designated legally tight. Therefore, all gas production referenced herein is eligible for the Section 29 tax credit. Although the qualification period for the credit expired at the end of 1992, wells that were spudded (began to be drilled) between 1978 and May 1988, and from November 5, 1990, through year end 1992, are eligible for the tax credit for a subsequent period of 10 years. This report updates the EIA's tight gas production information through 1991 and considers further the history and effect on tight gas production of the Federal Government's regulatory and tax policy actions. It also provides some high points of the geologic background needed to understand the nature and location of low-permeability reservoirs.

135 (ETDE-IT–93-227) **Natural gas industry R&D.** Pavan, S. 1992. 25p. (In Italian). (CONF-9211224–26: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716535. Source: OSTI; NTIS (US Sales Only); INIS.

The last three decades have witnessed significant developments in engineering relative to the distribution and use of natural gas. This paper reviews these developments which, in natural gas distribution, include - polyethylene conduits, the use of radar to trace buried conduits, telemetering, innovative pressure reducing techniques and equipment, optimized retrofitting of buried pipelines, leak detection techniques, and energy recovery systems applied to pressure reducing operations. Relative to the efficient combustion and new uses of natural gas, the paper reviews the state-of-the-art in the design of compact wall mounted gas fired boilers for building space heating, gas fuelled space heating ventilation and air conditioning systems, and natural gas fed fuel cells.

0307 Waste Management

Refer also to citation(s) 90

0308 Environmental Aspects

Refer also to citation(s) 92, 93, 130, 924, 1306, 1319, 1334, 1359, 1361

136 (CONF-930495–, pp. 38-44) **Clean air: Level the NOX playing field for all fuels.** Rosenberg, W.G. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

In the Northeast and other non attainment areas, a level playing field NOx standard that applies to electric utilities and other major sources would offer numerous benefits, including: (1) Lower the risk of having to expend billions of dollars of refinery retrofit costs which will lead to much higher gasoline prices at the pump, in order to comply with a California Fuel VOC standard or other very expensive VOC strategy; (2) Establish a new market potential of 1 tcf for natural gas as a generating fuel in the summertime when pipeline capacity is available, which may also lead to a higher values for natural gas, reflecting its inherently cleaner nature; (3) Provide an opportunity for the environmental community, and the natural gas, refining and utility industries, as well as the State Air and PUC regulators, to work together to demonstrate environment leadership and promote a cost-effective clean air attainment strategy; and (4) Achieve cleaner air, sooner, at a lower cost. Support of this cost effective Clean Air solution will pay big dividends. This reformulation of State ozone strategies by adopting a level playing field NOx standard is both environmentally effective to attain the air quality health standards, and a least cost compliance strategy for regional economies.

137 (CONF-930495–, pp. 567-569) **DOE/NARUC - National conference on natural gas use.** Fassett, P.H. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The efforts of ALCOA to reduce noxious gas emissions at its plants are discussed. Most Public Utility Commissions (PUCs) want compliance to be the least net cost to ratepayers. Next cost considers last coal mine worker jobs and considers lost commerce from high utility rates. State legislative actions and other political activity may make achieving least cost compliance difficult. Scrubbers, natural gas co-firing, fuel bleeding, and emission allowances are solutions that offer lower cost and avoid the political concerns of disrupting mine worker jobs. The advantages and disadvantages of these solutions are discussed.

138 (ETDE-IT–93-225) **Natural gas for public and private transportation: Present situation and prospects.** Gambino, M.; Iannaccone, S.; Unich, A. 1992. 18p. (In Italian). (CONF-9211224–28: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716533. Source: OSTI; NTIS (US Sales Only); INIS.

In recent years, the use of natural gas as an automotive fuel for private and public vehicles has grown due to its interesting chemical-physical properties which make it an efficient fuel and more environmentally compatible than conventional fuels. This promising consumption trend has led to increased R&D investments

in attempts to enhance the fuel's automotive performance and exhaust emission characteristics. This paper reviews the advances in these directions which have been made thus far by research teams around the world and assesses commercialization prospects for natural gas automotive fuels in light of the more stringent air pollution regulations being proposed by the European Communities.

0310 Legislation and Regulations

Refer also to citation(s) 106, 109, 111, 113, 114, 115, 116, 118, 119, 120, 122, 123, 124, 126, 127, 132

139 (CONF-930495–, pp. 45-48) **Remarks of Peter A. Bradford.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

From a regulatory standpoint, the concept of a BTU tax is multifaceted. The recognition of some efficiency and security concerns will reverberate positively in the debate over environmental externalities and will give a boost to DSM and renewable resources. The tax is clearly an operating expense. Operating expenses are clearly recoverable. If the tax passes on the schedule proposed, utilities will have ample time to file to recover in rates any portion that does not go through the various automatic adjustment clauses. The disadvantages of the BTU tax are discussed.

140 (CONF-930495–, pp. 49-52) **BTU energy tax.** Coburn, L.L. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The goals of the BTU energy tax are presented in outline form. The primary goal of the tax is to raise money. Other goals, important but subsidiary to the revenue goal, are conservation, the environment, and national security, i.e., lowering of oil imports. The BTU tax introduces the idea of a broad based tax on consumption but unlike the value added tax (VAT), it will produce more revenue, more quickly with less administration cost. Its impact on international competitiveness will be low and energy costs, even after the imposition of the tax, will be lower in the US than in the other G-7 nations except Canada.

141 (CONF-930495–, pp. 53-56) **The law of unintended consequences.** Baly, M. III. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A law that is of particular concern to the natural gas industry, and should be of concern to this audience is the law of unintended consequences. It is not a law that has been passed by Congress or signed by the President. But is is a law that could come back to haunt them. It is the law of unintended consequences – a law it is believed will quickly go into effect if the proposed BTU tax is enacted and if the proposed collection point for this tax – at the city gate – becomes a reality. It is because of the law of unintended consequences that both the BTU tax and the collection point chosen by the Treasury Department is opposed. A few examples are given to prove that point. The BTU tax was not intended to be unfair, or hardest on the poor. Yet in reality the tax is regressive. Both directly and indirectly the costs will fall disproportionally on low- and middle-income consumers. The direct impact will be higher utility and transportation costs, which will obviously hurt the poor the most. They spend a much higher share of their disposable income on energy than do the rich. And while there are provisions to help offset the impact on poor households, the middle-class will feel the full burden of this tax. Other disadvantages of the BTU tax are discussed.

142 (CONF-930495–, pp. 57-63) **NARUC DOE conference.** Jordan, C. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A panel discussion on the Clinton BTU tax proposal is presented. Five points are discussed: (1) how does the tax impact on each of the primary energy sources; (2) what other factors must be considered; (3) the impact of the tax on gas versus coal-one of the primary competitors to natural gas; (4) the alternative taxing mechanisms; and (5) where is the tax proposal going from here. It is concluded that the successful implementation of this tax on energy opens a door that, in all probability, will never be closed. It is two lucrative and too environmentally justified to ever go away once it is established.

143 (CONF-930495–, pp. 177-193) **IRP, DSM, and fuel switching panel.** Rabago, K.R. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The experience of the Public Utility Commission (PUC) of Texas as the regulator of electric utilities in the state is presented. The PUC does not regulate natural gas in Texas; that is the jurisdiction of the Railroad Commission. The PUC regulates the customers of the natural gas business. The Texas electric utilities are the largest simple state consumer for natural gas for boiler fuel. The electric utilities seem to be at a low point in a deliberate long-term effort to reduce dependence on natural gas as a boiler fuel. Solutions to the problem of natural gas and electric supply and fuel switching must be devised by industry. Some proposals for solving these problems are discussed.

144 (CONF-930495–, pp. 261-286) **Supply planning in the post-order No. 636 environment.** Bickle, L.W. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

An important consideration for both Local Distribution Companies (LDCs) and Public Utilities Commissions (PUCs) is that deregulation implies competition. Competition implies winners and losers, and winners and losers are separated by differences in physical performance and technology, not "regulatory clout." Thus, it is important to shift their attention from just regulatory affairs to regulatory affairs coupled with physical understanding of the grid and the various technical and physical elements of supply reliability. The supply planning function at the LDC level and the review process at the PUC is going to be very interesting in the post-Order No. 636 environment. It represents a lot of opportunities and lots of challenges. Generally speaking, those companies that recognize the value of Market Centers, the need for high-deliverability swing in the production area, the need to "layer" their storage, the need to diversify their transportation, and the need to unify supply portfolio with "global" information systems will be the winners in a process that now has both winners and losers.

145 (CONF-930495–, pp. 287-329) **Capacity options: Independent power producers, pipeline capacity, and state commissions.** Schretter, J. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural

gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

A panel discussion is presented on returned gas issues facing the states, i.e., capacity options, independent power producers (IPPs), pipeline capacity, and state commissions. IPPs are expected to be the largest new users of pipeline capacity in the next 10 years. The increased use of gas will come from significant new investments in power plants. IPPs can help states increase employment, maintain or lower residential and commercial energy costs-both electric and gas, increase economic development, and provide a cleaner environment. State commissions can assist IPPs obtain pipeline capacity needed to maximize benefits by: (1) promoting use of capacity release agreements; (2) urging FERC to allow maximum flexibility of firm shippers to use their capacity; and (3) pressing FERC to consider the broader economic and environmental benefits resulting from the use of gas, especially for power generation.

146 (CONF-930495–, pp. 348-357) **Bill Shane's bullets.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The argument is made that the BTU tax on natural gas should be collected downstream not upstream. There should be 100% pass-through to customers of the BTU tax by state Public Utility Commissions based on the take or pay structure. Two key premises for the upstream collection of the BTU tax are that production issues are less important than they once were and the fundamentals of the natural gas market are in good shape. The following topics are outlines: (1) components of reliable service; (2) the "old" reliability; (3) the "new" reliability; (4) what is the Resonance Conservation and Recovery Act (RCRA); (5) RCRA re-authorization: what is at stake; and (6) waste management conclusions.

147 (CONF-930495–, pp. 358-406) **The mineral estate and natural gas producer in the post-636/Energy Policy Act Era.** Vessels, T.J. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Current activity in the USA has been described as a "predicament" in which the country has substantial geologic basins with many producing formations that are only marginally profitable. For this reason, the development of many of these basins has been and continue to be highly sensitive to wellhead pricing. Therefore, long-term-not short-term-production, regulatory and tax policies are critical to exploration maintenance. The natural gas industry of the USA is a world class industry. We have a high level of technical expertise among both the major, and particularly the independent, gas producers, which enables us to go after the incremental MCF of gas in mature areas. We are further ahead on the learning curve than the gas industry in many other countries because our natural gas industry is already mature and has a large market. A large number of giant fields or "elephants" have been discovered and many more remain to be found. Because the market is more or less in clos proximity to the resource and there is a relatively mature delivery system connected to the established resource base, any modest increase in price can be expected to quickly result in increased activity to recovery an incremental volume of gas. If prices are low but stable, efficiencies will quickly develop that will result in additional reserve appreciation an economic activity. Two fundamental points to the discussion topic are: we have a lot of natural gas in the USA; and (although usually unmentioned) the majority of gas is privately vs. governmentally (federal and state) owned. Furthermore, the government-owned natural gas is generally leased and transferred to private interests for development. This is important because many countries have natural gas resource that come on stream only if the government so dictates. Our system of mineral ownership provides the foundation for Order 636 to function.

148 (CONF-930495–, pp. 407-484) **Draft report: Status of petroleum production industry in California: The cost of regulatory compliance.** USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The production sector of the oil and gas industry in California has been in decline since 1985 with an attendant loss of jobs and state revenues. This large and important industry is sustaining declines similar to those experienced in the manufacturing sector – reduced output and employment. Are the costs of regulations on California oil and gas producers part of the cause of the downturn? Foster Economics was retained by the Department of Conservation (DOC) to examine the regulatory compliance costs on the oil and gas producing industry, to answer this question and to make recommendations. Six tasks were specified by the contract: (1) identify the impacts of the oil and gas production industry on state and local employment and public revenues; (2) compile a list of environmental and other laws and regulations that affect the oil and gas production industry; (3) estimate costs associated with complying with regulations and summarize the cost impacts of these factors on the oil and gas production industry of California; (4) identify laws and regulations which have a high cost/benefit ratio (low benefit/cost ratio) and pose excessive burden on the oil and gas production industry; (5) identify regulatory overlaps among agencies and regulations; and (6) develop a corrective action plan to lessen the regulatory cost burden to the industry without compromising environmental protection. The study team undertook a survey of oil and gas producers and agencies both to confirm environmental regulations and determine their costs. The survey was conducted over the six oil and gas producing districts of California. The results of the findings are presented and discussed.

149 (CONF-930495–, pp. 570-572) **Use of innovative administrative procedures to cut the gordian knot: State PSC policy-making for more competitive gas markets.** Burns, R.E. (National Regulatory Research Institute, Columbus, OH (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Historically federal and state public utility commissions have relied heavily on adjudicatory procedures to make industry-wide policy decisions. However, many of the issues that face state and federal regulators today are basic, industry-wide policy issues that implicitly or explicitly require the agency to make economic and financial decision about future events and conditions and to engage in regulatory planning or policy making based on these decisions. To meet this need, regulatory agencies need to become more progressive, economic regulatory and planning bodies geared toward promoting efficient policy that fit into the broader economic system. Adjudicatory procedures are, however, cumbersome vehicles to address progressive policy issues, because an agency's decision is limited to the record as presented by the parties. It also causes an agency to be passive and reactive, to respond to the pressures of the parities, and to fail to define its own agenda and fully exercise its power. Further, adjudicatory procedures are limited in their ability to take into account economic and financial issues in the face of uncertainty. Only through and Alternative Dispute Resolution (ADR), consensus-building form of administrative procedure can state commissions eliminate regulatory options that fail to properly align the interests of the ratepayers in lower cost reliable gas with the interests of the LDC to increase profits. And, only through such

an ADR process will a performance-based incentive mechanism result. Further, such an ADR process is necessary to keep a performance-based system operating, particularly when it becomes necessary or desirable to reset the benchmark.

150 (CONF-930495–, pp. 573-580) **Regulators, themselves.** Manshio, C.K. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

We are currently undergoing a period of transition in politics, economics and regulation. The end points of which remain uncertain. Public utility regulation can provide a microcosm of these changes and how to deal with them. Like politics and economics, public utilities must adapt to a new reality. For utilities the landscape has become competitive; just as their responses cannot be based on a regulated mentality; regulators need to better reflect market changes in the manner in which they regulate. Even ratepayer expectations have not remained the same. As a result regulators must decide whether they will defer to the expectations manifested by ratepayers or continue to act for ratepayers. The attitudes of regulators in this transition is important. They can lead, follow, or be overwhelmed by expectations and events. The requirements for the job of public utility regulator are discussed.

151 (CONF-930495–, pp. 581-583) **Deregulatory dynamics: Bypass and reckoning in the California gas market.** Bradley, R.L. Jr. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Competitive developments in the California gas market are forcing the California Public Utilities Commission (CPUC) to abandon rate penalization and heavy-handed regulation of noncore gas transportation. The noncore market includes industrial, enhanced oil recovery, and electric generation customers in the state. The following topics are discussed: (1) how pipeline-to-pipeline competition in California, first proposed in the early 1960s, finally overcame regulatory obstacles and began in 1992; (2) how California went from a capacity-constrained market to the most overbuilt interstate pipeline market in the US; (3) the current regulatory predicament created by state and federal regulation that unintentionally promoted bypass and stranded investment from excess capacity; (4) the new policy initiatives of the CPUC to address the current predicament; and (5) the growing chorus of regulatory reformers outside of the CPUC.

152 (CONF-930495–, pp. 584-589) **Industrial markets: Trying to adapt to life under order 636.** Merrels, A.S. USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

An examination of the topical issues about the market potential for natural gas and the impact of State regulation on gas use is presented. Industry and regulators must give more than lip service to the fact that these issues are interdependent. The following issues are discussed: (1) state commission and Local Gas Distribution Companies (LDCs) Reactions to the Department of Energy's Notice of Inquiry Concerning State Gas Regulation; (2) state commission and LDC Reactions to Order 636 and Pipeline Restructuring Proceedings at FERC; and (3) the way industrial gas consumers see it.

153 (CONF-930495–, pp. 590-591) **Service to industrial markets.** Patrylo, R.J. (Niagara Mohawk Power Corp., Syracuse, NY (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

Niagara Mohawk supports efforts to deregulate the natural gas industry. Competition has existed in the gas industry for some time and it is here to stay. While increased competition can benefit all customers, transition to more fully deregulated markets will create winners and losers. Niagara Mohawk intends to focus on the opportunities and be a winner. Unbundled transportation service has been offered for about seven years and a form of no notice services for two and one half years. Last year we were the first to introduce capacity brokering service in New York. We plan to work with the NYS Public Service Commission to offer an expanded menu of additional gas services to industrial customers. We're looking at doing this within the regulatory framework thereby capturing benefits for the firm ratepayer while avoiding the duplication and added expense of an independent marketing entity. The services that Niagara Mohawk plans to offer its customers are described.

154 (CONF-930495–, pp. 638-666) **Natural gas, power generation and order No. 636: Regulatory and commercial issues that must be addressed for the courtship to lead to consummation.** Bowe, J.F. Jr. (Hunton & Williams, Washington, DC (United States)). USDOE, Washington, DC (United States). [1993]. From DOE/NARUC national conference on natural gas use: state regulation and market dynamics in the post-636/Energy Policy Act, Era; New Orleans, LA (United States); 26-28 Apr 1993. In *Conference on natural gas use state regulation and market dynamics in the Post 636/Energy Policy Act Era: Proceedings.* 666p. Order Number DE93019185. Source: OSTI; NTIS; INIS.

The ongoing restructuring of the interstate natural gas pipeline industry pursuant to the Federal Energy Regulatory Commission's Order No. 636 presents both opportunities and threats for expanded use of natural gas as a power generation fuel. As the pipeline industry and its regulators write on a clean slate, developing transportation tariff provisions that will guide the provision of unbundled transportation services, they can do many things to make the use of gas in power generation applications more attractive, less challenging for plant operators and less financially risky than it has been in the past. Or, the industry could be allowed to adopt transportation tariff provisions that will increase the operational and financial risk of committing to gas as a power generation fuel. Power generators require substantial flexibility in their fuel delivery systems in order to accommodate the wide swings in electric demand to which they must be prepared to respond instantaneously. They also require some certainty as to the delivered price they will pay for the fuel they consume. The principles of economic dispatch cannot easily tolerate retroactive changes in the various components that make up the delivered cost of natural gas.

155 (ETDE-IT–93-223) **Europe's Common Market: Natural gas sector normatives and certification.** Musazzi, V. (SNAM SpA, Milan (Italy)). 1992. 35p. (In Italian). (CONF-9211224–30: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716531. Source: OSTI; NTIS (US Sales Only); INIS.

Europe's Common Market offers an interesting challenge to its member countries' natural gas distribution system operators in that which regards the creation of a European-wide natural gas control board, and European standardization and regulatory committees contemporaneously guaranteeing a free market for suppliers, as well as, consumer protection. Relative legislation and normatives activities will be deemed the responsibility of the European administrative structure and the the European Normatives Committee respectively. This paper briefly illustrates the progress that has been accomplished thus far in the standardization of technical aspects. Focus is on the certification of natural gas distribution system constructors.

0320 Transport, Handling, and Storage

Refer also to citation(s) 135, 927

156 (ANL/ES/CP–79268) **Insights gained from studies of gas pipeline rights-of-way of varying ages through wetlands.** Zimmerman, R.E. (Argonne National Lab., IL (United States)); Shem, L.; Van Dyke, G.D. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by Gas Research Inst., Chicago, IL (United States). DOE Contract W-31109-ENG-38. Contract 5088-252-1770. (CONF-9309254–1: 5. international symposium on environmental concerns in rights-of-way (ROW) management, Montreal (Canada), 19-22 Sep 1993). Order Number DE94001279. Source: OSTI; NTIS; GPO Dep.

Impacts of gas pipeline rights-of-way (ROWs) through wetlands depend on types of habitat, construction techniques, final elevations, ROW maintenance practices, soil composition, and local climate. In some instances factors unrelated to the presence of the pipeline may have greater impacts on wetland modification than does the pipeline itself. At one site, the required seeding program inhibited natural reestablishment of wetland plants; at another, downstream construction resulted in a major disruption to the adjacent wetland habitat. This paper discusses observation from 13 study sites, each zero to 30 years old, that are located in seven Eastern States.

157 (ETDE-IT–93-224) **Gas turbines for natural gas transport and storage.** Zampieri, G. (SNAM SpA, Milan (Italy)); Sabella, D. 1992. 19p. (In Italian). (CONF-9211224–29: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716532. Source: OSTI; NTIS (US Sales Only).

In order to compensate for pressure drop, the long distance transport of natural gas along pipeline networks requires the use of compression stations spaced from 100 to 200 km apart. In the past, conventional equipment for this purpose consisted of alternative compressors driven by alternative engines or fixed speed electric motors. Subsequently, to allow operation in conditions characterized by wide ranging pressures and flow rates, gas distribution system operators began to use gas turbines combined with variable speed centrifugal compressors. Today, the gas turbine, due to its great flexibility of use, auxiliary fuel independence, good performance and environmental compatibility represents the optimum driving unit for gas compressors. To illustrate this point, this paper reviews the main design, operation and performance characteristics of the Nuovo Pignone PGT-10 and PGT-25 gas turbines. The gas generator design of the latter 23, 300 kW gas generator-power turbine unit is based on that of the General Electric TF 39/CF-6 jet engine used on Boeing 747's and DC-10's.

0330 Properties and Composition

Refer also to citation(s) 138, 160

0340 Combustion

Refer also to citation(s) 42, 135, 137, 654, 655, 657, 671, 885, 886, 936

158 (AAA-KTF/FKF–90/7) **Parametric study of natural gas reburn chemistry using kinetic modelling.** Kilpinen, P. (Aabo Akademi, Turku (Finland)); Hupa, M.; Glarborg, P.; Hadvig, S. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 46p. Order Number DE94709675. Source: OSTI; NTIS.

The effects of combustion parameters on the reburn chemistry of natural gas (methane) were studied using detailed chemical kinetic modelling. The reburn process was described by applying a comprehensive reaction scheme consisting of 225 elementary reactions and 48 chemical species to an ideal plug flow reactor. The effects of flue gas composition (NO, O_2), amount of reburn fuel temperature, and residence time on the reduction of total-fixed-nitrogen in the reburn zone were then examined for a number of conditions relevant for natural gas reburning. A brief investigation was also performed to study the effects of reburn zone flue gas composition (HCN, NH_3, NO, CO) and temperature on the conversion of fixed nitrogen to N_2 in the burn out zone. Calculations showed that the optimum primary zone stoichiometry lies near an air/fuel stoichiometric ratio RR_1=1.05-1.1. The optimum reburn zone stoichiometry is about SR_2=0.9-0.95. In the reburn zone high temperatures generally enhance the NO reduction, whereas in the burn-out zone the temperature should be as low as possible to convert the entering HCN, NH_3, and NO species to N_2. In addition, the most important reactions for the reduction of NO in the reburn zone, and for the oxidation of HCN and NH_3 in the burn-out zone were identified. Finally, the calculations were compared with experimental reburning data from the literature. The impact of a number of various physical effects, not accounted for in the ideal plug flow calculations, on the optimum conditions predicted is discussed.

159 (DOE/METC/C–93/7091) **Pressurized burner test facility.** Maloney, D.J.; Norton, T.S.; Hadley, M.A. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). (CONF-9306148–14: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019737. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's METC has recently completed construction and commissioning of a new high-pressure combustion research facility. Utilities servicing the facility enable combustion tests at scales up to 3 MW (10 MM Btu/h) and pressures in excess of 3000 kPa (30 atm). These include a preheated, high-pressure air supply that can deliver up to 1.7 kg/s (3.7 lbs/s) of combustion air, and a high-pressure, natural gas compressor that can deliver 0.8 kg/s (.19 lbs/s). In the summer of 1994 METC's syngas generator is scheduled to come on line, at which time combustion tests on a range of fuel gases from low to medium to high heating values will be possible. The syngas generator will simulate a range of fuel gas compositions characteristic of coal gasification product streams. As part of the combustion facility, a high-pressure burner test facility is currently being constructed to support the development of gas turbine combustion systems fired on natural gas and coal-derived gaseous fuels containing fuel-bound nitrogen. The facility, illustrated in Figure 1, is a 61-centimeter (24-inch) diameter, refractory-lined vessel of modular construction, offering the flexibility to test a variety of NO_x control concepts. Burner test modules are sandwiched between gas inlet and sampling plenums with a maximum combustion test zone of 2.2 m (90 inches) in length. Modules are custom designed for specific burners.

160 (EUR–14439) **Determination of the gross calorific value of natural gas: Results of a BCR intercomparison.** Vandendriessche, S. (Commission of the European Communities, Brussels (Belgium)); Marchandise, H.; Dempsey, T.; Byrne, P.G. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 30p. Source: OSTI; NTIS (US Sales Only).

This report describes the results of an intercomparison project in which the GCV (Gross Calorific Value) of natural gas was determined by 14 European laboratories using two approaches: - direct measurement (calorimetry); - determination of the gas composition (by gas chromatography) and calculation of the GCV according to ISO 6976. The work was done with two gas compositions. For calorimetry the coefficient of variation (CV) was 0.15% when considering all laboratories, or 0.09% using when considering the laboratories using the most accurate methodologies. For gas chromatography, the CV was 0.15% when considering all laboratories, or 0.03% when considering those using the most accurate methodologies. The difference between the mean results of calorimetry and the mean values derived from gas chromatography was 0.01 - 0.02%. (author). 27 tabs.

161 (SVF–475) **Development of a catalytic combustor: Final report.** Ahlstroem, F. (Katator AB, Ideon, Lund (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 150p. (In Swedish). Order Number DE94709791. Source: OSTI; NTIS.

The purpose of the study was to investigate the combustion characteristics of an axial catalytic combustor. The combustor consists of two tubes with different diameters. The smaller tube is placed inside the larger one to create a concentric intertubular layer which is filled with catalyst. The air/fuel mixture is distributed uniformly over the concentric cross-section and is then led through the pre-heating zone and the catalytic bed where the combustion takes place. The flue gases leave the combustor through the central flue gas channel, i.e. the smaller tube. The studies have focused on the following items: (1) Different catalysts, (2) Influence

of increased pre-heating, (3) Effect of a thermal reservoir in the catalyst bed, (4) Varied catalyst activity along the bed, and (5) Catalytic combustion of other fuels than methane. A dynamic simulation algorithm was developed to facilitate the evaluation of experimental data. The model was verified with experimental data and the agreement between calculated and experimental data was excellent. 19 refs, 54 figs, 4 tabs.

04 OIL SHALES AND TAR SANDS

0404 Oil Production, Recovery, and Refining

162 (DOE/MC/11076–3380) **Upgrading of western shale oil by hydropyrolysis and hydrotreating.** Bunger, J.W.; Russell, C.P.; Jeong, Soon-Yong; Pu, J. Utah Univ., Salt Lake City, UT (United States). Dept. of Fuels Engineering. Jul 1992. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE93000298. Source: OSTI; NTIS; GPO Dep.

A proof-of-concept study for a new shale oil upgrading and refining process was undertaken. This project is aimed at reducing upgrading costs, thereby malting shale oil development more feasible for commercialization. Raw shale oil was topped to remove the most volatile components. The topped shale oil was distilled into three narrow boiling cuts, representing of 175–275°C, 275–365°C, and 365–455°C, and a residue portion (>455°C). The distillate cuts were used to study molecular weight effects, and the residue was used to test the performance of hydropyrolysis. Hydropyrolysis converts the heavy residue into lower boiling point materials which can be more easily hydrotreated. In the experiment to test molecular weight effects, it was found that geometric hindrance accounts for the inhibition effect. Diffusion limitation and inhibition by competitive adsorption are not strong effects. These results imply that there is no process substitute for the requirement of molecular weight reduction. In the experiment to test the performance of hydropyrolysis, average molecular weight is reduced from 495 to 359 at moderate severities. In HDN of the hydropyrolized residue, however, high process severities are still required to remove nitrogen to the level of refinery-acceptable-feed (< 0.15 wt %). Based on experimental data, the product slate is 1.9 wt % gas, 13.1 wt % gasoline, 27.3 wt % kerosene, 55.6 wt % total gas oil, 1.3 wt % vacuum residue, and 0.8 wt % coke with 1376 scf/bbl total hydrogen consumption. The removal of sulfur is 96%, and that of nitrogen is 84%. The concentration of sulfur in the final product is 0.038 wt %, and that of nitrogen in final product is 0.26%. The conversion of heavy residue to atmospheric distillate is 47%. However, the remaining residue is partially upgraded as a refinery feed.

0407 Health and Safety

163 (MSHA/IR–1210) **Injury experience in stone mining, 1991: Information report.** Mine Safety and Health Administration, Denver, CO (United States). 1993. 516p. Sponsored by Department of Labor, Washington, DC (United States). Order Number DE94001247. Source: OSTI; NTIS.

This Mine Safety and Health Administration (MSHA) informational report reviews in detail the occupational injury and illness experience of stone mining in the united States for 1991. Data reported by operators of mining establishments concerning work injuries are summarized by work location, accident classification, part of body injured, nature of injury, occupation, and principal type of mineral. Related information on employment, worktime, and operating activity also is presented. Data reported by independent contractors performing certain work at mining locations are depicted separately in this report. For ease of comparison with other metal and nonmetallic mineral mining industries and with coal mining, summary reference tabulations are included at the end of both the operator and the contractor sections of this report.

0409 Waste Management

164 (DOE/MC/11076–3410) **Evaluation of energies of interaction correlated with observed stabilities and rheological properties of asphalt-aggregate mixtures of western shale-oil residue as a modifier to petroleum asphalt.** Tauer, J.E.; Ensley, E.K.; Harnsberger, P.M.; Robertson, R.E. Western Research Inst., Laramie, WY (United States). Feb 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE93011306. Source: OSTI; NTIS; GPO Dep.

The objective of this study was to perform a preliminary evaluation of improving bonding and aging characteristics using a distillation residue from the Green River Formation (western) shale oil as a modifier to a petroleum asphalt for use as a crack and joint filler material in portland cement concrete and asphaltic pavements. This study was to examine the differences in moisture damage resistance and adhesion properties, as measured by bonding energy, of shale-oil modified asphalts compared with non-modified asphalts. The shale-oil modified asphalts mechanical properties were not expected to match those of the rubberized asphalt. A commercially available rubberized asphalt crack and joint filler material was also tested only for comparison of mechanical properties. Portland cement concrete briquets prepared with an asphalt material sandwiched between two concrete wafers were tested in a stress-relaxation type of experiment to evaluate the relaxation and recovery properties of the sealant materials. Energy of interaction (bonding energy) measurements were performed on asphalt materials with portland cement concrete, two silicate aggregates, and a limestone aggregate to evaluate the compatibility of the asphalt materials with various aggregates. The results show that the shale-oil modified petroleum asphalt improved the relaxation time, percent recovery, and bonding energy compared with the petroleum asphalt.

05 NUCLEAR FUELS

Refer also to citation(s) 1122, 1285, 1402

165 (INIS-mf–13386) **Proceedings of the international symposium on uranium techology [held at Bombay during 13-15 Dec 1989]. V. 1.** Department of Atomic Energy, Bombay (India). Board of Research in Nuclear Sciences. 1991. 472p. (CONF-8912172–: International symposium on uranium technology, Bombay (India), 13-15 Dec 1989). Order Number DE93608776. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

166 (INIS-mf–13387) **Proceedings of the international symposium on uranium technology [held at Bombay during 13-15 Dec 1989]. V. 2.** Department of Atomic Energy, Bombay (India). Board of Research in Nuclear Sciences. 1991. 653p. (CONF-8912172–: International symposium on uranium technology, Bombay (India), 13-15 Dec 1989). Order Number DE93608801. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

0501 Reserves, Exploration, and Mining

Refer also to citation(s) 1998, 2034, 2037, 2044, 2074

167 (DOE/EA–0326) **Environmental assessment of remedial action at the inactive uraniferous lignite ashing sites at Belfield and Bowman, North Dakota.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001480. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 authorized the US Department of Energy (DOE) to perform remedial actions at Belfield and Bowman inactive lignite ashing sites in southwestern North Dakota to reduce the potential public health impacts from the residual radioactivity remaining at the sites. The US Environmental Protection Agency (EPA) promulgated standards (40 CFR 192) that contain measures to control the residual radioactive materials and other contaminated materials, and proposed standards to protect the groundwater from further degradation. Remedial action at the Belfield and Bowman sites must be

performed in accordance with these standards and with the concurrence of the US Nuclear Regulatory Commission (NRC) and the state of North Dakota. The Belfield and Bowman designated sites were used by Union Carbide and Kerr-McGee, respectively, to process uraniferous lignite in the 1960s. Uranium-rich ash from rotary kiln processing of the lignite was loaded into rail cars and transported to uranium mills in Rifle, Colorado, and Ambrosia Lake, New Mexico, respectively. As a result of the ashing process, there is a total of 158,400 cubic yards (yd^3) [121,100 cubic meters (m^3)] of radioactive ash-contaminated soils at the two sites. Windblown ash-contaminated soil covers an additional 21 acres (8.5 ha) around the site, which includes grazing land, wetlands, and a wooded habitat.

168 (EUR–14690, pp. 143-151) **Okelobondo Uranium deposit: Regional context, stratigraphy, sedimentology, tectonic and mineralization.** Ango, A.M. (Compagnie Miniere de l'Ogooue, Moanda (Gabon)). Commission of the European Communities, Luxembourg (Luxembourg). 1993. (In French). (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes briefly the geology of Okelobondo uranium deposit (Gabon) and gives the study prospects of natural reactor phenomenon which depends of the operating progress state. Oklo phenomenon is considered as the best natural analogue for the study of radionuclide migration. 3 figs.

169 (INIS-mf–13731, pp. 62) **Lignite and tin ores exploration in southern part of Thailand by using nuclear track-etch detectors.** Chittrakarn, T. (Prince of Songkla Univ. (Thailand)); Boonnummar, R.; Pongsuwan, T.; Nuannin, P.; Arrykul, S.; Poenthong, P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIGNITE/dielectric track detectors; LIGNITE/exploration; TIN ORES/dielectric track detectors; TIN ORES/exploration; LIGNITE; EXPLORATION; THAILAND

170 (INIS-mf–13731, pp. 307) **Uranium fission track micro-mapping and its application.** Zhao Yunlong (Beijing Research Inst. of Uranium Geology, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM MINERALS/fission tracks; URANIUM ORES/fission tracks; SPATIAL DISTRIBUTION; USES

0504 Feed Processing

Refer also to citation(s) 392

171 (CNIC–00672) **Study on hydrodynamics and mass transfer of the critically safe multistage mixer-settler.** Zhang Weibo (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Jiao Rongzhou; Liu Bingren; Wang Shulan. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 8p. (In Chinese). (TSHUNE–0052.). Order Number DE94604170. Source: OSTI; NTIS (US Sales Only); INIS.

The study on structure of critically safe multistage mixer-settler for the extraction process of high enriched uranium and plutonium has been completed. The mixer-settler has simple structure, good critical safety, flexibility in operation (O/A from 0.5 to 5) and high extraction efficiency (E_x > 90%). These performances have been proved in the hydrodynamics and mass transfer experiments at a three stages cascade mixer-settler. Based on the others experience, a trapezoidal impeller combined with half-open turbine is developed which has stronger pumping and well mixing function at low rotating speed. The optimal rotating speed is 250 to 280 r/min obtained by experiments.

0505 Uranium Enrichment

Refer also to citation(s) 419, 725, 1908, 1909

172 (CEA-CONF–11371) **Copper vapour laser development for Silva.** Bettinger, A. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement); Neu, M.; Maury, J.; Chatelet, J. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement. 1993. 9p. (CONF-9301130–: OELASE '93: International symposium on lasers, sensors, applications, Los Angeles, CA (United States), 18-22 Jan 1993). Order Number DE94604519. Source: OSTI; NTIS (US Sales Only); INIS.

The recent developments of the components for high power Copper Vapour Laser (CVL) have been oriented towards four main goals: high quality laser beam, mainly for the CVL oscillators, increase of the extracted energy out of the amplifying stage, fully integrated and monolithic design for oscillator and amplifier, extended lifetime and high reliability. A first step of this work, which is done under contract with CILAS (Compagnie Industrielle des Lasers) led to an injection seeded oscillator and a 100 Watts amplifier; the present step concerns development of a 400 Watts class amplifier.

173 (CEA-CONF–11372) **Atomic vapour laser isotope separation in France.** Camarcat, N. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement); Lafon, A.; Perves, J.P.; Rosengard, A.; Sauzay, G. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement. 1993. 12p. (CONF-9301130–: OELASE '93: International symposium on lasers, sensors, applications, Los Angeles, CA (United States), 18-22 Jan 1993). Order Number DE94604682. Source: OSTI; NTIS (US Sales Only); INIS.

France has a specific position in the uranium enrichment market. It has a major nuclear park, supplying 75% of the nation's electricity. On one hand the modern multinational EURODIF gaseous diffusion plant (10.8 M.SWU/y) works smoothly, and its supply of nuclear generated electricity offers customers a good long term view on enrichment costs. A program to improve its performances and to extend its lifespan is well in progress. It will offer a fast modulation capability, with advantage of off-peak power for about 3/4 of its electrical requirements. On the other hand, today's situation of over capacity, accentuated by non-commercial practices, may lead to a brutal restructuring of the world-wide enrichment industry in the coming years. The French approach has a long term goal, with a priority for a high performance process, which will be available when world stocks of enriched uranium are exhausted, and aging enrichment plants have to be shut down. To reach this goal, French Atomic Energy Commission has focused since 1985 on the atomic laser route, SILVA, in agreement with the industrial operator, COGEMA. Fully integrated pre-industrial experience, too costly, will be delayed as long as possible, toward the end of the decade. It will benefit from the most advanced options, taking into account the difficulty of changing them once demonstration has been achieved. The SILVA program is periodically assessed from both the scientific and the industrial point of view and a general assessment is to be made between 1996 and 1997, prior to pre-industrial development.

174 (CEA-CONF–11373) **IGBT: a solid state switch.** Chatroux, D. (CEA Centre de Pierrelatte, 26 (France)); Maury, J.; Hennevin, B. CEA Centre de Pierrelatte, 26 (France). 1993. 9p. (CONF-9301130–: OELASE '93: International symposium on lasers, sensors, applications, Los Angeles, CA (United States), 18-22 Jan 1993). Order Number DE94604520. Source: OSTI; NTIS (US Sales Only); INIS.

A Copper Vapour Laser Power Supply has been designed using a solid state switch consisting in eighteen Isolated Gate Bipolar Transistors (IGBT), -1200 volts, 400 Amps, each-in parallel. This paper presents the Isolated Gate Bipolar Transistor (IGBTs) replaced in the Power Electronic components evolution, and describes the IGBT conduction mechanism, presents the parallel association of IGBTs, and studies the application of these components to a Copper Vapour Laser Power Supply. The storage capacitor voltage is 820 volts, the peak current of the solid state switch is 17.000 Amps. The switch is connected on the primary of a step-up transformer, followed by a magnetic modulator. The

reset of the magnetic modulator is provided by part of the laser reflected energy with a patented circuit. The charging circuit is a resonant circuit with a charge controlled by an IGBT switch. When the switch is open, the inductance energy is free-wheeled by an additional winding and does not extend the charging phase of the storage capacitor. The design allows the storage capacitor voltage to be very well regulated. This circuit is also patented. The electric pulse in the laser has 30.000 Volt peak voltage, 2000 Amp peak current, and is 200 nanoseconds long, for a 200 Watt optical power Copper Vapour Laser.

175 (CEA-CONF–11374) **TRIO-EF a general thermal hydraulics computer code applied to the Avlis process.** Magnaud, J.P.; Claveau, M.; Coulon, N.; Yala, P.; Guilbaud, D.; Mejane, A. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement. 1993. 15p. (CONF-9301130–: OELASE '93: International symposium on lasers, sensors, applications, Los Angeles, CA (United States), 18-22 Jan 1993). Order Number DE94604521. Source: OSTI; NTIS (US Sales Only); INIS.

TRIO(EF) is a general purpose Fluid Mechanics 3D Finite Element Code. The system capabilities cover areas such as steady state or transient, laminar or turbulent, isothermal or temperature dependent fluid flows; it is applicable to the study of coupled thermo-fluid problems involving heat conduction and possibly radiative heat transfer. It has been used to study the thermal behaviour of the AVLIS process separation module. In this process, a linear electron beam impinges the free surface of a uranium ingot, generating a two dimensional curtain emission of vapour from a water-cooled crucible. The energy transferred to the metal causes its partial melting, forming a pool where strong convective motion increases heat transfer towards the crucible. In the upper part of the Separation Module, the internal structures are devoted to two main functions: vapor containment and reflux, irradiation and physical separation. They are subjected to very high temperature levels and heat transfer occurs mainly by radiation. Moreover, special attention has to be paid to electron backscattering. These two major points have been simulated numerically with TRIO-EF and the paper presents and comments the results of such a computation, for each of them. After a brief overview of the computer code, two examples of the TRIO-EF capabilities are given: a crucible thermal hydraulics model, a thermal analysis of the internal structures.

176 (DOE/ER/12891–4) **Innovative lasers for uranium isotope separation: Final report, September 1, 1989–April 1, 1993.** Brake, M.L.; Gilgenbach, R.M. Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering. Jul 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER12891. Order Number DE94001729. Source: OSTI; NTIS; INIS; GPO Dep.

Copper vapor laser have important applications to uranium atomic vapor laser isotope separation (AVLIS). We have investigated two innovative methods of exciting/pumping copper vapor lasers which have the potential to improve the efficiency and scaling of large laser systems used in uranium isotope separation. Experimental research has focused on the laser discharge kinetics of (1) microwave, and (2) electron beam excitation/pumping of large-volume copper vapor lasers. Microwave resonant cavity produced copper vapor plasmas at 2.45 GHz, have been investigated in three separate experimental configurations. The first examined the application of CW (0-500W) power and was found to be an excellent method for producing an atomic copper vapor from copper chloride. The second used a pulsed (5kW, 0.5–5 kHz) signal superimposed on the CW signal to attempt to produce vaporization, dissociation and excitation to the laser states. Enhanced emission of the optical radiation was observed but power densities were found to be too low to achieve lasing. In a third experiment we attempted to increase the applied power by using a high power magnetron to produce 100 kW of pulsed power. Unfortunately, difficulties with the magnetron power supply were encountered leaving inconclusive results. Detailed modeling of the electromagnetics of the system were found to match the diagnostics results well. An electron beam pumped copper vapor system (350 kV, 1.0 kA, 300 ns) was investigated in three separate copper chloride heating systems, external chamber, externally heated chamber and an internally heated chamber. Since atomic copper spectral lines were not observed, it is assumed that a single pulse accelerator is not capable of both dissociating the copper chloride and exciting atomic copper and a repetitively pulsed electron beam generator is needed.

177 (UCRL-JC–114864) **Laser absorption spectroscopy system for vaporization process characterization and control.** Galkowski, J.; Hagans, K. Lawrence Livermore National Lab., CA (United States). 7 Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309199–6: Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation, Boston, MA (United States), 7-10 Sep 1993). Order Number DE94000308. Source: OSTI; NTIS; GPO Dep.

In support of the Lawrence Livermore National Laboratory's (LLNL's) Uranium Atomic Vapor Laser Isotope Separation (U-AVLIS) Program, a laser atomic absorption spectroscopy (LAS) system has been developed. This multi-laser system is capable of simultaneously measuring the line densities of ^{238}U ground and metastable states, ^{235}U ground and metastable states, iron, and ions at up to nine locations within the separator vessel. Supporting enrichment experiments that last over one hundred hours, this laser spectroscopy system is employed to diagnose and optimize separator system performance, control the electron beam vaporizer and metal feed systems, and provide physics data for the validation of computer models. As a tool for spectroscopic research, vapor plume characterization, vapor deposition monitoring, and vaporizer development, LLNL's LAS laboratory with its six argon-ion-pumped ring dye lasers and recently added Ti:Sapphire and external-cavity diode-lasers has capabilities far beyond the requirements of its primary mission.

0507 Fuels Production and Properties

Refer also to citation(s) 265, 395, 475, 765, 766, 1045, 1046, 1047, 1048, 1049, 1050, 1095, 2538

178 (DOE/OR/00033–T532) **Radiative heat transfer in porous uranium dioxide.** Hayes, S.L. (Texas A and M Univ., College Station, TX (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Texas A and M Univ., College Station, TX (United States). Dec 1992. 230p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000826. Source: OSTI; NTIS; GPO Dep.

Due to low thermal conductivity and high emissivity of UO_2, it has been suggested that radiative heat transfer may play a significant role in heat transfer through pores of UO_2 fuel. This possibility was computationally investigated and contribution of radiative heat transfer within pores to overall heat transport in porous UO_2 quantified. A repeating unit cell was developed to model approximately a porous UO_2 fuel system, and the heat transfer through unit cells representing a wide variety of fuel conditions was calculated using a finite element computer program. Conduction through solid fuel matrix as wekk as pore gas, and radiative exchange at pore surface was incorporated. A variety of pore compositions were investigated: porosity, pore size, shape and orientation, temperature, and temperature gradient. Calculations were made in which pore surface radiation was both modeled and neglected. The difference between yielding the integral contribution of radiative heat transfer mechanism to overall heat transport. Results indicate that radiative component of heat transfer within pores is small for conditions representative of light water reactor fuel, typically less than 1% of total heat transport. It is much larger, however, for conditions present in liquid metal fast breeder reactor fuel; during restructuring of this fuel type early in life, the radiative heat transfer mode was shown to contribute as much as 10-20% of total heat transport in hottest regions of fuel.

179 (HW–3-1812) **Minutes of 200 Area conference on canyon and concentration Bldg. (221–224) problems on February 15, 1945.** Squires, L. Hanford Works, Richland, WA (United States). 2 Mar 1945. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001616. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. SEPARATION EQUIPMENT/operation; HANFORD RESERVATION; OPERATION; FAILURES; SEPARATION PROCESSES; MEETINGS

180 (HW–45119) **Proposed ion exchange applications in the Hanford separations processes.** Brown, B. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 5 Nov 1956. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001626. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses the use of solvent extraction techniques at HAPO for separating plutonium from uranium and fission products which is rather expensive. This is in part due to solvent, chemical and process steam costs and in part to the need for complicated equipment to handle the process. It is felt that the use of ion exchange resin techniques might be economically attractive both as to lowered chemical costs and equipment simplification. Also, the decontamination achieved by solvent extraction is at time marginal. Changing to another process following partial decontamination by solvent offers the possibility of greater over-all DF's.

181 (HW–55283) **224-UA continuous calciner trough examination.** Kennedy, R.A. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 10 Mar 1958. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041096. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The continuous calciners at UO_3 Plant are of a new design which was developed at HAPO and placed in service late in 1956. The heat transfer troughs are considered to be the most vulnerable parts of the calciners because of their high operating temperatures. Thermal stresses are calculated to be quite high, and when added to the direct mechanical stresses from powder load etc., come close to the limiting safe stress for stainless steel at the operating temperature. It is felt that trough failure will be progressive as a result of creep type distortion and cracks at stress concentration points. The higher the stress (and temperature), the more rapid the rate of failure will be. All possible steps have been taken to limit maximum trough temperature, rate of change, and variations from one part of the trough to another. These steps were not always successful and various troughs have been subjected to rather severe temperature shocks as well as high mechanical stresses due to agitator failures. Despite these difficulties, no signs of failure could be detected by visual inspection. It was decided, therefore, that a more complete examination should be made. This examination was made to determine the present condition of one of the troughs and a discussion of results is provided.

182 (HW–57225) **Hanford Laboratories Operation monthly activities report, August 1958.** General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Sep 1958. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001665. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This is the monthly report of the Hanford Laboratories Operation, August 1958. Reactor fuels, chemistry, separation processes, reactor technology, financial activities, biology operation, physics and instrumentation research, employee relations, plutonium recycling, programming, radiation protection, laboratory auxiliaries operation, and inventions are discussed.

183 (HW–61570-Del.) **Status of plutonium trichloride process development (2).** Hopkins, H.H. Jr. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 14 Aug 1959. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000422. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The development of a reduction step using plutonium trichloride instead of plutonium tetrafluoride in 234-5 Building processing was proposed early in 1958. This process change was intended to reduce the neutron radiation associated with plutonium fluoride. Neutron dose estimates shaw that over half of 234-5 Building neutron exposure is associated with the fluoride process steps. Other measurements show that a 60-fold reduction in neutron flux could be realized by converting to a chloride process. Progress up to September 1958, was described in a document covering the chemical aspects of the development work, including batch preparation of trichloride. The present report summarizes work done on this process over the past year, emphasizing continuous preparation of plutonium trichloride in large-scale equipment, the reduction of this product to metal, and large-scale recovery of slag and crucible.

184 (LA–12371-MS) **The potential of squeeze casting for the production of near net shape uranium parts.** Robertson, E. (United States Air Force Academy, Colorado Springs, CO (United States). Materials Div.). Los Alamos National Lab., NM (United States). Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001008. Source: OSTI; NTIS; GPO Dep.

This report was written to provide a detailed summary of a literature survey on the near net shape squeeze casting process. Squeeze casting was evaluated as a possible method for achieving the goals of the LANL program titled Near Net Shape Casting of Uranium for Reduced Environmental, Safety, and Health Impact. In this report the squeeze casting process is reviewed and an assessment of its ability to achieve the near net shape and waste minimization goals of the LANL program is made. It is concluded that although squeeze casting is capable of producing near net shaped parts and reducing the amount of subsequent machining (thereby decreasing wastes), to use the process with uranium would require the design of a unique piece of equipment capable of performing the melting, pouring and squeezing operations in close proximity and in a vacuum.

185 (SR/H–625) **Project 8980, Savannah River Plant, Separations Area, Building 221-H, Air lift for run tank decanters.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 10 Oct 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000608. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the installation of an air lift for run tank decanters for transferring the decanted solvent directly back to the mixer-settler from which it came.

186 (SR/H–626) **Project 8980, Savannah River Plant, Separations Area, Building 221-H, Second product cycle solvent.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 17 Oct 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000609. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses recommendations on the use of a second product cycle solvent system as an added assurance for producing specification material.

187 (SR/H–627) **Project 8980, Savannah River Plant, Separations Area, Bldg. 221-H, Acid recovery from high activity waste.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 18 Oct 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000610. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses possible process changes in the "H" Area to provide for acid recovery from high activity waste.

188 (SR/H–628) **Project 8980, Savannah River Plant, Separations Area, Building 221-H, Continuous hot solvent recovery.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 21 Jul 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000611. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides recommendations for modifications to the continuous hot solvent recovery system at Building 221-H.

189 (SR/H–629) **FDM 359H, HAW: Acid Recovery.** Fowler, B.J. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 5 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000528. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a discussion of the operation and installation of acid recovery system in the 200 Area.

190 (SR/H–630) **Ball check valves, Project 8980, Savannah River Plant, FDM 262-H, S8-1025 (WR 25933).** Fowler, B.J. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 8 Feb 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SEP-P–11-20). Order Number DE94001019. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a discussion on the design and installation of check valves in the canyon jumpers.

191 (SR/H–631) **Miscellaneous information, Bldg. 232-H.** Conaway, J.E. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 8 Feb 1956. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001020. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses equipment and procedures utilized in Building 232-H.

192 (SR/H–632) **Project 8980: Savannah River Plant, Building 232-F, extraction furnace.** Meyer, C.A. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 11 Nov 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001021. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses operating experience and weaknesses of the Building 232-F extraction furnaces. Recommended design changes are provided.

193 (SR/H–633) **Project 8980: Savannah River Plant, 200-H Area, Building 221-H, rerun station.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 18 Nov 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001022. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the design, installation, modification, and utilization of equipment in the Building 221-H Rerun Station.

194 (SR/H–634) **Project 8980: 200 Area, continuous solvent washing: FDM 262-H.** Christl, R.J. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 6 Jan 1956. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001023. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the schedule for completion of all facilities necessary for continuous solvent washing in the 200 Area.

195 (SR/H–635) **Project 8980, Savannah River Plant, 232-F, Improved extraction furnaces.** Meyer, C.A. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 16 Jan 1956. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001024. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses redesign and modifications of the 232-F extraction furnaces.

196 (SR/H–638) **PWO 6019-H, Savannah River Plant, Separations Area, Building 232-H, Rehabilitation.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 13 Feb 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001027. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses equipment and procedures utilized in Building 232-H.

197 (SR/H–639) **Project 8980, Savannah River Plant, 200 Area, Building 221-H, Hot canyon samplers, Additional shielding.** Taber, B.L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 24 Feb 1956. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001028. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a discussion of the additional shielding requested for the hot canyon samplers in Building 221-H.

198 (SR/H–640) **Project 8980: Savannah River Plant, Separations Area, Building 221-H, segregated solvent systems, FDM 262-H.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 1 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001029. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the design and installation of segregated solvent systems equipment in Building 221-H.

199 (SR/H–641) **Project 8980: Savannah River Plant, Separations Areas FDM 359-H, high activity waste acid recovery.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 12 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001030. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses modifications to the high activity waste acid recovery system in the Separations Area.

200 (SR/H–642) **Project 8980: Savannah River Plant, 200 Area, PWO 6008-F, increased evaporator and denitrator capacity No. 6 deep pot off-gas system.** Taber, B.L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 12 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001031. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the problem of denitrator off-gas line pluggage for the number 6 deep pot off-gas system.

201 (SR/H–646) **Project 8980: Savannah River Plant, Separations Area, Building 221-H, FDM 262-H, segregated solvent system.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 21 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001987. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the installation of the instrumentation for control of the organic recycle rate within the continuous solvent washers in Building 221-H.

202 (SR/H–647) **Project 8980, Savannah River Plant, Separations Area, Building 211-H, FDM 262-H, Segregated solvent systems.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 22 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001988. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the design and installation of the segregated solvent systems in Building 211-H.

203 (SR/H–648) **Project 8980, Savannah River Plant, Separations Areas, Building 221-H, FDM 262-H, Rerun station.** Farrow, W.H. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 26 Mar 1956. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001989. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses alterations made to the Rerun Station at Building 221-H.

204 (SR/H–651) **[Ser]ourne hot extrusion of Type 309 Crib seamless pipe].** Landrum, R.J. Hanford Engineer Works, Richland, WA (United States). 28 Jul 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001887. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides details of travel to the Babcock & Wilcox Tubular Products Division in Beaver Falls, Pennsylvania. The purpose of the trip was to discuss problems in regard to Type

309 seamless pipe which had been produced by the new Sojourne hot extrusion process.

205 (SR/H–654) **Project 981081: Savannah River Plant, 200 Area, Building 221H, materials engineering, dissolver columns, extra charges by sun ship.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 18 Feb 1959. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002250. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses extra charges for welding due to difficulties resulting from use of materials supplied by Du Pont. Plate and welding rod composition are discussed as possible factors in the weld cracking problem.

206 (UCRL-JC–112821) **Kinematics and thermodynamics across a propagating non-stoichiometric oxidation phase front in spent fuel grains.** Stout, R.B.; Kansa, E.J.; Wijesinghe, A.M. Lawrence Livermore National Lab., CA (United States). Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306116–2: 1. joint meeting of the Society of Engineering Science, Inc., and the American Society of Mechanical Engineering and the American Society of Civil Engineers, Charlottesville, VA (United States), 6-9 Jun 1993). Order Number DE93041108. Source: OSTI; NTIS; INIS; GPO Dep.

Spent fuel contains mixtures, alloy and compound, but are dominated by U and O except for some UO_2 fuels with burnable poisons (gadolinia in BWR rods), the other elements evolve during reactor operation from neutron reaction and fission + fission decay events. Due to decay, chemical composition and activity of spent fuel will continue to evolve after removal from reactors. During the time interval with significant radioactivity levels relevant for a geological repository, it is important to develop models for potential chemical responses in spent fuel and potential degradation of repository. One such potential impact is the oxidation of spent fuel, which results in initial phase change of UO_2 lattice to U_4O_9 and the next phase change is probably to U_3O_8 although it has not been observed yet below 200C. The U_4O_9 lattice is nonstoichiometric with a O/U weight ratio at 2.4. Preliminary indications are that the UO_2 has a O/U of 2. 4 at the time just before it transforms into the U_4O_9 phase. In the oxygen weight gain versus time response, a plateau appears as the O/U approaches 2.4. Part of this plateau is due to geometrical effects of a U_4O_9 phase change front propagating into UO_2 grain volumes; however, this may indicate a metastable phase change delay kinetics or a diffusional related delay time until the oxygen density can satisfy stoichiometry and energy conditions for phase changes. Experimental data show a front of U_4O_9 lattice structure propagating into grains of the UO_2 lattice. To describe this spatially inhomogenous oxidation phase transition, as well as the expected U_3O_8 phase transition from the U_4O_9 lattice, lattice models are developed and spatially discontinuous kinematic and energetic expressions are derived. 9 refs.

0508 Spent Fuels Reprocessing

Refer also to citation(s) 263, 266, 271, 980, 1148, 1225

207 (ANL/CMT/CP–78029) **Pyrochemical methods for actinide recovery from LWR spent fuel.** McPheeters, C.C.; Pierce, R.D.; Poa, D.S.; Maiya, P.S. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930913–33: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE93040239. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Pyrochemical methods are being developed at Argonne National Laboratory for extraction of transuranium elements from light water reactor spent fuel for bumup as fuel in the integral fast reactor (IFR). Recycling of these transuranium elements would avoid the expense and potential long-term risk of their disposal in a geological repository, and, at the same time, would provide a large energy reserve for future electrical energy needs. The pyrochemical methods involve reduction of the oxide spent fuel to metals, separation of the transuranium fraction as a consolidated ingot for feed to the IFR fuel cycle, decontamination of the uranium product for long term storage or re-enrichment, and processing the wastes to produce waste forms suitable for repository disposal. Small scale experiments have been done to demonstrate the processes, and the process steps are being scaled up for engineering-scale demonstration.

208 (ANL/CMT/PP–75527) **A spreadsheet algorithm for stagewise solvent extraction.** Leonard, R.A.; Regalbuto, M.C. Argonne National Lab., IL (United States). Jan 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040895. Source: OSTI; NTIS; INIS; GPO Dep.

Part of the novelty is the way in which the problem is organized in the spreadsheet. In addition, to facilitate spreadsheet setup, a new calculational procedure has been developed. The resulting Spreadsheet Algorithm for Stagewise Solvent Extraction (SASSE) can be used with either IBM or Macintosh personal computers as a simple yet powerful tool for analyzing solvent extraction flowsheets.

209 (CEA-CONF–11417) **Reprocessing cruds: some tetravalent actinides monobutylphosphate insoluble complexes.** Livet, J.; Musikas, C. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1992. 2p. (CONF-9204201–: 22. actinides meeting, Meribel (France), 22-25 Apr 1992). Order Number DE94604171. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PUREX PROCESS/precipitation; IRON COMPLEXES; MBP; NITRATES; NITRIC ACID; PRECIPITATION; THORIUM COMPLEXES; URANIUM COMPLEXES; ZIRCONIUM COMPLEXES

210 (CEA-CONF–11456) **Comparative synergistic (technetium-actinide) extraction chemistry by tributylphosphate and some amide extractants.** Condamines, N. (CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement); Musikas, C.; Delmau, L. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 8p. (CONF-9304213–: Actinides meeting, Buehl (Germany), 20-23 Apr 1993). Order Number DE94604172. Source: OSTI; NTIS (US Sales Only); INIS.

In nuclear fuel reprocessing, technetium (TcO_4^-) leads to bad interferences in the extractions, being synergistically co-extracted with different actinide cations as Uranium (VI), Plutonium (IV) and Zirconium (IV). It destroys the hydrazine in the reductive partition of U and Pu, it decreases the decontamination of U and Pu from fission products. Thus, its extraction behaviour with new extractants as N,N-diakylamides is useful to be known. TcO_4^- extraction in nitric acid media is compared for TBP and different amides. The influence of nitric acidity is related to the amides formula.

211 (CNIC–00648) **Design features of multicell device of electrostatic pseudo liquid membrane.** Gu Zhongmao (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Guan Zongzhou; Wu Quanfeng; Zheng Zuoxi; Jin Lanrui; Chen Xi. China Nuclear Information Centre, Beijing, BJ (China). Jul 1992. 8p. (IAE–0109.). Order Number DE94604173. Source: OSTI; NTIS (US Sales Only); INIS.

Electrostatic pseudo liquid membrane (ESPLIM) separation process, developed recently in the laboratory, is a novel liquid membrane separation technology. It can be used to separate, purify and concentrate specific solute(s) from aqueous solutions. It is potentially competitive in the fields of hydrometallurgy (including nuclear fuel cycles) and waste water treatment. Some design features of multicell setup of the ESPLIM process are discussed.

212 (HW–46396) **Change of scope relocation of Purex cooling water swamp project CA-683.** Wood, V.W. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 26 Oct 1956. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040784. Source: OSTI; NTIS (US Sales Only); GPO Dep.

It has been proposed that facilities be provided which can be used to divert the Purex cooling water from the facilities already proposed on this project to a depression within the 540 ft. elevation contour at approximate plant coordinates 34,300 N, 40200 W.

These facilities are in addition to the change of scope referred to in reference (1). The purpose of these new facilities is to forma hydrologic dam as part of the ground water table which would aid in the confining of contamination and/or restricting the movement of contamination in the south easterly direction.

213 (HW–48325) **Application of Critical Mass document HW-44064 to the Purex Process.** Gustafson, L.D. Hanford Atomic Products Operation, Richland, WA (United States). 5 Feb 1957. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040980. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document is a supplementary operating guide to document HW-44064, "Process Specifications for Critical Mass Control – Purex Plant." It is primarily intended that this document illustrate the actual operational means of conforming to the limits of critical mass control as presented in HW-44064.

214 (HW–52740) **A critical review of alternate methods of Purex solvent treatment.** Gordon, N.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 20 Sep 1957. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001623. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document is a HAPO report dated September 20, 1957. At the time of this report, there had been many different methods suggested for improving the Purex organic recovery system. Some of these suggestions been tried in the plant and others had not. Information concerning this system and, particularly, methods for improving it were wide spread. At the time of this report was no immediate source of information available on the proposed and investigated methods for improving the Purex solvent recovery system.

215 (HW–55963-RD) **The self-concentration of high level Purex wastes in the hot semiworks waste concentrator.** DeWitt, R.D.; Sloat, R.J. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 12 Jan 1959. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040785. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Prior to the startup of the Purex Plant it was considered desirable to study the "self-concentration" of wastes likely to be encountered in the Purex waste storage system. Consequently, a 39-inch diameter 35-foot high tank was built at the Hot Semiworks. This tank was designed to represent a core of the 75-foot diameter Purex waste tanks. During the period of Purex testing at the Hot Semiworks the tank was filled with "typical" Purex waste and self-concentration phenomena were studied. As pertinent data were developed from the studies it was informally transmitted to interested parties for use in establishing safe waste storage criterion for the Purex system. This document summarizes the Hot Semiworks waste self-concentrator basic data. No attempt has been made to cross-correlate this data with actual Purex experience although data are sufficiently detailed to permit calculation of such correlations.

216 (HW–64162) **Preliminary project proposal expansion to 4.0 capacity factor – Purex.** Finch, L.W. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 4 Apr 1960. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040788. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this preliminary project proposal is to request authority to perform the design work for modifications of the Purex Plant to provide a capacity equivalent to a "4.0 capacity factor."

217 (HW–64450) **Purex Plant flowsheet for high capacity study.** Geier, R.G.; Duckworth, J.P. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 28 Mar 1960. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000423. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report contains a flowsheet which was prepared to serve as a guide for an engineering study to be made to determine the costs and revisions required to increase the capacity of the Purex Plant to a 4.0 capacity factor. The needs for such a study are outlined in documents HW-62952 (Ref. 1) and HW-63927 (Ref. 2), which include increased 100 Area production forecasts and maximizing Palm recovery by continuous recovery equipment as primary factors. The flowsheet, shown graphically on the flowsketch and specifically in tabular form under Table 1, is a "best estimate" of process conditions and modifications which will be in operation by the third quarter of FY 1962. The modifications included are: Formaldehyde Treatment of Concentrated Wastes – IWW (Ref. 5 and 6); A Continuous Palm Recovery Cycle; A Palm Ion Exchange Purification and Loadout Facility (Ref. 3); Alkaline-Permanganate Washing of the No. 2 Organic System Solvent; and Rough-cut Fission Product Recovery and Shipping (Ref. 4). Since the fission product recovery and shipping operations do not effect the equilibrium conditions of the plant, they are not included in the flovsheet.

218 (HW–67666) **Engineering study, strontium-90 and rare earth processing in B-Plant.** Caudill, H.L.; LaRiviere, J.R.; Michels, L.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 17 Jan 1961. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001143. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The primary objective of the Hanford Fission Product Program is to provide technical and manufacturing support to the Atomic energy Commission in the large-scale preparation of fission products. This report presents the results of an engineering study on production-scale facilities at B-Plant for the recovery and storage of fission product concentrates, beyond the capabilities of interim program equipment. The new facilities would be provided as Phase I of a multi-phase program for the reactivation of B-Plant both for fission product recovery and calcination of high level wastes.

219 (HW–79645) **Process design scope criteria Purex multipurpose dissolvers.** Ehrlich, R.D.; LaRiviere, J.R. (comps.). Hanford Atomic Products Operation, Richland, WA (United States). 15 Oct 1963. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040984. Source: OSTI; NTIS (US Sales Only); GPO Dep.

An engineering study was recently performed by Separations Process Design Engineering to determine the feasibility of processing the total Chemical Processing Department production load in the Purex Plant. This document summarizes the results of the study and the basis for the scope design or the multipurpose dissolvers for the Purex Plant.

220 (JAERI-M–93-061) **Databook of the isotopic composition of spent fuel in light water reactors.** Naito, Yoshitaka (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Kurosawa, Masayoshi; Kaneko, Toshiyuki. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1993. 231p. (In Japanese). Order Number DE94718955. Source: OSTI; NTIS; INIS.

In the framework of the activity of the nuclide production evaluation WG in the sigma committee, we summarized the measurement data of the isotopic composition of LWR spent fuels necessary to evaluate the accuracy of the burnup calculation codes. The collected data were arranged to be classified into the irradiation history of the fuel samples, the composition of the fuel assemblies, the sampling position and the isotopic composition of the fuel samples, in order to supply the information necessary to the benchmark calculation. This report describes the data collected from the 13 LWRs including the 9 LWRs (5 PWR and 4 BWR) in Europe and the USA, the 4 LWRs (2 PWR and 2 BWR) in Japan. Finally, the study on the burnup characteristics of the U, Pu isotopes is described. (author).

221 (JAERI-M–93-127) **Development of computer code PNST for analyzing transient phenomena in plutonium nitrate storage tank.** Abe, Hitoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Tachimori, Shoichi; Suzuki, Shin-ichi; Naito, Yoshitaka. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 44p. (In Japanese). Order Number DE94718960. Source: OSTI; NTIS; INIS.

After being separated and purified by the Purex process, Plutonium is temporarily stored in storage tanks in form of plutonium nitrate solution. In the solution, radiolysis gases are generated with

α-decay of plutonium and plutonium concentration proceeds with evaporation of water and nitric acid. Nitric acid solution is added to the solution for the prevention of concentration of plutonium in the tank. On the other hand, it is known that plutonium forms polymer in case of low acid concentration. If solution of low acid concentration (in extreme case, water or basic solution) is added to the storage tank by miss operation or failure of equipments, the formation of the polymer will happen. The formation of the polymer and the subsequent precipitation might jeopardize the criticality safety. A simulation code PNST (Simulation code for Transient Phenomena in a Plutonium Nitrate Storage Tank) has been developed for the safety evaluation of plutonium nitrate storage tank under normal and abnormal conditions. PNST consists of PNST-N and PNST-A. The variation of valences of chemical species, generation of radiolysis gases and volume of the storage solution in the normal condition are analyzed by PNST-N. On the other hand, the polymerization behavior of plutonium by adding solution of low acid concentration is calculated by PNST-A. This report is prepared as an explanation of the code as well as a user's manual. (author).

222 (SR/H–655) **Savannah River Plant, 200 Areas, Materials Engineering, Stainless steel fabrication discussion, May 6, 1959.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 14 May 1959. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002251. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report describes the corrosion and fabrication of stainless steels used in the Separations Technology Department at Savannah River Plant, May 1959.

223 (WHC-SA–1821) **Plasma techniques for reprocessing nuclear wastes.** Siciliano, E.R.; Lucoff, D.M.; Omberg, R.P.; Walter, A.E. Westinghouse Hanford Co., Richland, WA (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930913–43: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options; American Nuclear Society (ANS) winter meeting, Seattle, WA (United States); San Francisco, CA (United States), 12-17 Sep 1993; 14-18 nov 1993; CONF-931 Order Number DE93040382. Source: OSTI; INIS; NTIS; GPO Dep.

A newly emerging plasma-based system, currently under development for material dissociation and mass separation applications in the area of high-level radioactive waste treatment, may have possible applications as a central processing unit for spent nuclear fuel reprocessing. Because this system has no moving parts and obtains separations by electromagnetic techniques, it offers a distinct advantage over chemically based separation techniques, in that the total waste volume does not increase. The basic concepts underlying the operation of this plasma-based system are discussed, along with the demonstrated and expected capabilities of this system. Possible fuel reprocessing configurations using this plasma-based technology are also mentioned.

224 (WINCO–1131) **ICPP Fluorinel Dissolution Process (FDP) Plant Protection System (PPS) baseline criteria evaluation.** Allen, G.W.; Clayton, R.J.; Fielding, K.D.; Mozes, M.L. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1993. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000719. Source: OSTI; NTIS; GPO Dep.

This report documents a baseline criteria evaluation of the FAST Plant Protection System (PPS) at the Idaho Chemical Processing Plant (ICPP). Westinghouse Idaho Nuclear Company (WINCO), Computer Process Application (CPA) personnel originally prepared this report as requested by the FAST Fluorinel Dissolution Process (FDP) Operational Readiness Review (ORR) committee. It was required by the ORR committee for the 1992 restart of FDP operations. However on April 29, 1992, the Department of Energy (DOE) directed WINCO to discontinue reprocessing of spent nuclear fuel at the ICPP. This eliminated the mission of the FDP. The report includes an evaluation of the PPS against criteria requested by the ORR committee and against criteria contained in the WINCO PPS Requirements Manual. This second criteria evaluation is summarized in Appendix A.

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Refer also to citation(s) 444, 1388, 1404, 1406

225 (ANL/FC/CP–78840) **Minimization of the effect of errors in approximate radiation view factors.** Clarksean, R.; Solbrig, C. Argonne National Lab., Idaho Falls, ID (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931005–1: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE93041183. Source: OSTI; NTIS; INIS; GPO Dep.

The maximum temperature of irradiated fuel rods in storage containers was investigated taking credit only for radiation heat transfer. Estimating view factors is often easy but in many references the emphasis is placed on calculating the quadruple integrals exactly. Selecting different view factors in the view factor matrix as independent, yield somewhat different view factor matrices. In this study ten to twenty percent error in view factors produced small errors in the temperature which are well within the uncertainty due to the surface emissivities uncertainty. However, the enclosure and reciprocity principles must be strictly observed or large errors in the temperatures and wall heat flux were observed (up to a factor of 3). More than just being an aid for calculating the dependent view factors, satisfying these principles, particularly reciprocity, is more important than the calculation accuracy of the view factors. Comparison to experiment showed that the result of the radiation calculation was definitely conservative as desired in spite of the approximations to the view factors.

226 (CONF-931161–1) **Low Specific Activity materials concepts are being reevaluated.** Rawl, R.R. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. international low-level waste conference and exhibition; Monterey, CA (United States); 9-12 Nov 1993. Order Number DE94001130. Source: OSTI; NTIS; INIS; GPO Dep.

Many types of radioactive low-level waste are classified, packaged, and transported as Low-Specific Activity (LSA) material. The transportation regulations allow LSA materials to be shipped in economical packagings and, under certain conditions, waives compliance with other detailed requirements such as labeling. The fundamental concepts which support the LSA category are being thoroughly reevaluated to determine the defensibility of the provisions. A series of national and international events are leading to the development of new dose models which are likely to fundamentally change the ways these materials are defined, Similar basis changes are likely for the packaging requirements applicable to these materials.

227 (DOE/OR–01-1167-D1) **Detailed leak detection test plan and schedule for the Oak Ridge National Laboratory LLLW active pipelines: Environmental Restoration and Waste Management Programs.** Douglas, D.G. (Vista Research, Inc., Mountain View, CA (United States)); Starr, J.W.; Juliano, T.M.; Maresca, J.W. Jr. Oak Ridge National Lab., TN (United States); Vista Research, Inc., Mountain View, CA (United States). Sep 1993. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–171-D1). Order Number DE94000424. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a detailed leak detection test plan and schedule for leak testing many of the pipelines that comprise the active portion of the liquid low-level waste (LLLW) system at the Oak Ridge National Laboratory (ORNL). This plan was prepared in response to the requirements of the Federal Facility Agreement (FFA) between the US Department of Energy (DOE) and two other agencies, the US Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC). The LLLW system is an interconnected complex of tanks and pipelines. The FFA distinguishes four categories of tank and pipeline systems within this complex: new systems (Category A), doubly contained systems (Category B), singly contained systems (Category C), and inactive systems (Category D). The FFA specifically requires leak testing of the Category C systems. This plan and schedule addresses leak testing of the Category C pipelines

and those doubly contained pipelines that do not fully meet the requirements for secondary containment as listed in the FFA.

228 (SR/H–622) **[Conversion of shipping facilities for shipment of uranium oxide in 5 ton containers].** Tinker, J.B. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 21 Jul 1955. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000605. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the conversion of the uranium oxide shipping facilities to ship the oxide in 5-ton containers instead of 800 lb. drums.

229 (SR/H–649) **Copy of notes from Faulds to file on shipping meeting, "C" Line, January 6, 1953, Louviers.** Huffman, R.W. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 8 Jan 1953. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001990. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum, and attachments, describes a meeting held to arrange for truck transport of the "C" Line from the Savannah River Site, to another destination. It describes arrangements for commercial trucking, packaging, loading, shipping, and security of the shipment during transit.

230 (WHC-SA–2021) **Underground storage tanks soft waste dislodging and conveyance.** Wellner, A.F. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931160–27: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94001681. Source: OSTI; NTIS; INIS; GPO Dep.

Currently 140 million liters (37 million gallons) of waste are stored in the single shell underground storage tanks (SSTs) at Hanford. The wastes contain both hazardous and radioactive constituents. This paper focuses on the Westinghouse Hanford Company's testing program for soft waste dislodging and conveyance technology. This program was initialized to investigate methods of dislodging and conveying soft waste. The main focus was on using air jets, water jets, and/or mechanical blades to dislodge the waste and air conveyance to convey the dislodged waste. These waste dislodging and conveyance technologies would be used in conjunction with a manipulator based retrieval system.

231 (WHC-SA–2087) **Structural testing of corrugated asbestos-cement roof panels Hanford Facilities, Richland, Washington.** Moustafa, S.E. (Wiss, Janney, Elstner Associates, Inc., Seattle, WA (United States)); Rodehaver, S.M.; Frier, W.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102–33: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94002410. Source: OSTI; NTIS; GPO Dep.

This report describes a roof testing program that was carried out at the 105KE/KW Spent Fuel Storage Basins and their surrounding facilities at the Hanford Site in Richland, Washington. The roof panels were constructed in the mid 1950's of corrugated asbestos-cement (A/C), which showed common signs of aging. Based on the construction specifications, the panels capacity to meet current design standards was questioned. Both laboratory and in-situ load testing of the corrugated A/C panels was conducted. The objective of the complete test program was to determine the structural integrity of the existing A/C roof panels installed in the 105KE and 105KW facilities. The data from these tests indicated that the roofs are capable of resisting the design loads and are considered safe. A second phase test to address the roof resistance to personnel and roof removal/roofing system installation equipment was recommended and is underway.

0510 Economic, Industrial, and Business Aspects

Refer also to citation(s) 173, 242

0520 Waste Management

Refer also to citation(s) 182, 187, 218, 223, 227, 230, 381, 382, 383, 390, 392, 409, 410, 411, 416, 420, 422, 423, 424, 426, 430, 432, 436, 444, 451, 453, 460, 461, 475, 487, 508, 728, 805, 807, 842, 1042, 1148, 1165, 1226, 1242, 1404, 1617, 1983, 1988, 1995, 2001, 2002, 2003, 2004, 2069, 2073, 2087, 2106, 2107, 2108, 2109, 2123, 2124, 2125, 2126, 2182, 2183, 2845

232 (AEA-D and R–0028) **The volume reduction of low level solid radioactive waste using a mobile supercompactor at Winfrith Technology Centre.** Rickard, L.R.K. AEA Decommissioning and Radwaste, Winfrith (United Kingdom). Jun 1993. 19p. Order Number DE94603549. Source: OSTI; NTIS (US Sales Only); INIS.

Studies have shown that the most cost effective method presently available to reduce the volume of low level radioactive waste (LLW) sent to Drigg is by high force mechanical compaction. High force compaction or supercompaction is a process by which whole containers of LLW (normally 200 litre drums) are reduced significantly in volume by mechanical compaction in a mould using a force of up to 2000 tonnes. The product is often referred to as a hockepuck . The supercompactor can be either a fixed installation or mounted on two or more trailers so that it can be moved to different sites. The Central Electricity Generating Board (CEGB) and the Winfrith Technology Centre (WTC) agreed to carry out demonstration campaigns at Trawsfyndd and Hinkley Point Nuclear Power Stations and at the WTC during the period August to October 1989. The CEGB placed a contract with Hansa Projekt Anlagentechnik GmbH of Hamburg in the Federal Republic of Germany (FRG) for the use of a commercial high force supercompactor, together with the necessary key staff. The purpose of the demonstration trial was to show that a mobile system is operationally satisfactory whilst also conforming to all the relevant safety requirements, both at the nuclear sites and during transport. A subsidiary aim was to generate technical data in an experimental programme designed to investigate the force-volume relationship. (Author).

233 (ANL/CMT/CP–78043) **Unvented thermal process for treatment of hazardous and mixed wastes.** Nelson, P.A.; Swift, W.M. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930572–12: 12. annual international symposium on thermal treatment technologies - incineration conference, Knoxville, TN (United States), 3-7 May 1993). Order Number DE93040824. Source: OSTI; NTIS; INIS; GPO Dep.

An Unvented Thermal Process is being developed that does not release gases during the thermal treatment operation. The main unit in the process is a fluidized-bed processor containing a bed of calcined limestone (CaO), which reacts with gases given off during oxidation of organic materials. Gases that will react with CaO include CO_2, SO_2, HCl, HBr, and other acid gases. Water vapor formed during the oxidation process is carried off with the fluidizing gas and is removed in a condenser. Oxygen is added to the remaining gas (mainly nitrogen), which is recirculated to the oxidizer. The most flexible arrangement of equipment involves separating the processor into two units: An oxidizer, which may be any of a variety of types including standard incinerators, and a carbon dioxide sorber.

234 (ANL/CMT/CP–78477) **Development of IFR pyroprocessing technology.** Laidler, J.J.; Battles, J.E.; Miller, W.E.; Gay, E.C. Argonne National Lab., IL (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930913–40: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE93040195. Source: OSTI; NTIS; INIS; GPO Dep.

A metallic fuel alloy, nominally U-20Pu-10Zr, is the key element of the IFR fuel cycle. This metallic fuel permits the use of an innovative reprocessing method, known as "pyoprocessing," featuring fused-salt electrorefining of the spent fuel. Electrorefining separates the actinide elements from fission products, without producing a separate stream of plutonium. The fuel product is contaminated with the higher actinides and with a minor amount of rare earth fission products, making it self-protecting and thus diversion-resistant

while still perfectly suitable as a fuel material in the fast spectrum of the IFR core.

235 (ANL/CMT/CP–79275) **Partition of actinides and fission products between metal and molten salt phases: Theory, measurement, and application to IFR pyroprocess development.** Ackerman, J.P.; Johnson, T.R. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930905–4: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000444. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical basis of Integral Fast Reactor fuel reprocessing (pyroprocessing) is partition of fuel, cladding, and fission product elements between molten LiCl-KCl and either a solid metal phase or a liquid cadmium phase. The partition reactions are described herein, and the thermodynamic basis for predicting distributions of actinides and fission products in the pyroprocess is discussed. The critical role of metal-phase activity coefficients, especially those of rare earth and the transuranic elements, is described. Measured separation factors, which are analogous to equilibrium constants but which involve concentrations rather than activities, are presented. The uses of thermodynamic calculations in process development are described, as are computer codes developed for calculating material flows and phase compositions in pyroprocessing.

236 (ANL/CMT/CP–79779) **Elements present in leach solutions from unsaturated spent fuel tests.** Finn, P.A.; Bates, J.K.; Hoh, J.C.; Emery, J.W.; Hafenrichter, L.D.; Buck, E.C.; Gong, M. Argonne National Lab., IL (United States). 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931108–3: Fall meeting of the Materials Research Society, Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94001458. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results for the composition of the leachate from unsaturated tests at 90°C with spent fuel for 55–134 days with J-13 groundwater are reported. The pH of the leachate solutions was found to be acidic, ranging from 4 to 7. The actinide concentrations were 10^5 greater than those reported for saturated spent fuel tests in which the leachate pH was 8. We also found that most species in the leachate were present as colloids containing both americium and curium. The presence of actinides in a form not currently included in repository radionuclide transport models provides information that can be used in spent fuel reaction modeling, the performance assessment of the repository and the design of the engineering barrier system. This report was prepared as part of the Yucca Mountain Site Characterization Project.

237 (ANL/CMT/CP–80775) **Extraction of technetium from simulated Hanford tank wastes.** Chaiko, D.J. (Argonne National Lab., IL (United States)); Vojta, Y.; Takeuchi, M. Argonne National Lab., IL (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94002362. Source: OSTI; NTIS; INIS; GPO Dep.

Aqueous biphasic separation systems are being developed for the treatment of liquid radioactive wastes. These extraction systems are based on the use of polyethylene glycols (PEGs) for the selective extraction and recovery of long-lived radionuclides, such as ^{129}I, ^{75}Se, and ^{99}Tc, from caustic solutions containing high concentrations of nitrate, nitrite, and carbonate. Because of the high ionic strengths of supernatant liquids in Hanford underground storage tanks, aqueous biphasic systems can be generated by simply adding aqueous PEG solutions directly to the waste solution. In the process, anionic species like I^- and TcO_4^- are selectively transferred to the less dense PEG phase. The partition coefficient for a wide range of inorganic cations and anions, such as sodium, potassium, aluminum, nitrate, nitrate, and carbonate, are all less than one. The authors present experimental data on extraction of technetium from several simulated Hanford tank wastes at 25° and 50°C.

238 (ANL/DIS/CP–80955) **Assessment of recycling or disposal alternatives for radioactive scrap metal.** Murphie, W.E. (USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Office of Environmental Restoration); Lilly, M.J. III; Nieves, L.A.; Chen, S.Y. Argonne National Lab., IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–20: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001476. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy, Office of Environmental Restoration and Waste Management, is participating with the Organization for Economic Cooperation and Development (OECD) is an evaluation of management alternatives for radioactive scarp metals. For this purpose, Argonne National Laboratory is assessing alternatives for radioactive scrap metals. For this purpose, Argonne National Laboratory is assessing environmental and societal implications of recycling and/or disposal process alternatives (with metal replacement). Findings will be presented in a report from the OECD Task Group. This paper focuses on the radiological risk assessment and dose estimate sensitivity analysis. A "tiered" concept for release categories, with and without use restrictions, is being developed. Within the tiers, different release limits may be indicated for specific groupings of radionuclides. Depending on the spectrum of radionuclides that are present and the level of residual activity after decontamination and/or smelting, the scrap may be released for unrestricted public use or for specified public uses, or it may be recycled within the nuclear industry. The conversatism of baseline dose estimates is examined, and both more realistic parameter values and protective measures for workers are suggested.

239 (ANL/EA/CP–79596) **Closure of shallow underground injection wells.** Veil, J.A. (Argonne National Lab., Washington, DC (United States)); Grunewald, B. Argonne National Lab., Washington, DC (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–5: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94000445. Source: OSTI; NTIS; INIS; GPO Dep.

Shallow injection wells have long been used for disposing liquid wastes. Some of these wells have received hazardous or radioactive wastes. According to US Environmental Protection Agency (EPA) regulations, Class IV wells are those injection wells through which hazardous or radioactive wastes are injected into or above an underground source of drinking water (USDW). These wells must be closed. Generally Class V wells are injection wells through which fluids that do not contain hazardous or radioactive wastes are injected into or above a USDW. Class V wells that are responsible for violations of drinking water regulations or that pose a threat to human health must also be closed. Although EPA regulations require closure of certain types of shallow injection wells, they do not provide specific details on the closure process. This paper describes the regulatory background, DOE requirements, and the steps in a shallow injection well closure process: identification of wells needing closure; monitoring and disposal of accumulated substances; filling and sealing of wells; and remediation. In addition, the paper describes a major national EPA shallow injection well enforcement initiative, including closure plan guidance for wells used to dispose of wastes from service station operations.

240 (ANL/EAIS/CP–80858) **Issues in recycling and disposal of radioactively contaminated materials.** Kluk, A.F. (Dept. of Energy, Washington, DC (United States)); Hocking, E.K.; Roberts, R.; Phillips, J.W. Argonne National Lab., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–19: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001293. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's present stock of potentially reusable and minimally radioactively contaminated materials will increase significantly as the Department's remediation activities expand. As part of its effort to minimize wastes, the Department is pursuing several approaches to recover valuable materials such as nickel, copper, and steel, and reduce the high disposal costs associated with contaminated materials. Key approaches are recycling radioactively contaminated materials or disposing of them as

non-radioactive waste. These approaches are impeded by a combination of potentially conflicting Federal regulations, State actions, and Departmental policies. Actions to promote or implement these approaches at the Federal, State, or Departmental level involve issues which must be addressed and resolved. The paramount issue is the legal status of radioactively contaminated materials and the roles of the Federal and State governments in regulating those materials. Public involvement is crucial in the debate surrounding the fate of radioactively contaminated materials.

241 (ANL/RE/CP–80533) **Effect of viscosity on seismic response of waste storage tanks.** Tang, Y. (Argonne National Lab., IL (United States)); Uras, R.A.; Chang, Y.W.; Eckert, H.J. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310102–19: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93041188. Source: OSTI; NTIS; INIS; GPO Dep.

A study of the effect of viscosity on the dynamic response of a liquid storage tank subjected to base excitations is presented. The tank is a typical high level waste storage tank which has a diameter of 50 ft. and liquid height of 20.4 ft. The liquid density is taken to be 93.6 lb/ft^3. The tank is assumed to be rigid. Both harmonic and earthquake excitations are used in the study. The finite element method is employed to attack the problem. The response functions examined include the sloshing wave height and the impulsive and convective components of the hydrodynamic pressure. A small tank, about 1/15 the size of the typical waste storage tank, is also used in the study to understand the effect of viscosity on the response of liquid storage tanks and to investigate the dependency of the viscosity effect on the size of the tank. The results of this study show that the effect of viscosity depends strongly on the size of the liquid-tank system. For the typical waste storage tank considered, the effect of viscosity on the sloshing wave height and the impulsive and convective pressures is very small and can be neglected. For the viscosity effect to become noticeable in the response of the typical waste storage tank, the liquid viscosity must be greater than 10,000 cP. This value is far greater than the estimated viscosity value of the high level wastes, which may range from 60 to 200 cP.

242 (CONF-9304190–1) **Word images as policy instruments: Lessons from the Yucca Mountain Controversey.** Conary, J.S.; Soden, D.L.; Carns, D.E. Nevada Univ., Las Vegas, NV (United States). [1993]. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. From Western Social Science Association meeting; Corpus Christi, TX (United States); 20-24 Apr 1993. Order Number DE93019282. Source: OSTI; NTIS; INIS; GPO Dep.

A study is described which explores word images which have developed about nuclear issues by Nevadans. The study is based on results of a survey conducted regarding issues related to the Yucca Mountain repository.

243 (CONF-9308150–5) **Contaminated scrap metal management on the Oak Ridge Reservation.** Hayden, H.W. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Stephenson, M.J.; Bailey, J.K.; Weir, J.R.; Gilbert, W.C. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Environmentally conscious manufacturing congress '93; Arlington, VA (United States); 30 Aug - 1 sep 1993. Order Number DE94000338. Source: OSTI; NTIS; INIS; GPO Dep.

Large quantities of scrap metal are accumulating at the various Department of Energy (DOE) installations across the country as a result of ongoing DOE programs and missions in concert with present day waste management practices. DOE Oak Ridge alone is presently storing around 500,000 tons of scrap metal. The local generation rate, currently estimated at 1,400 tons/yr, is expected to increase sharply over the next couple of years as numerous environmental restoration and decommissioning programs gain momentum. Projections show that 775,000 tons of scrap metal could be generated at the K-25 Site over the next ten years. The Y-12 Plant and Oak Ridge National Laboratory (ORNL) have similar potentials. The history of scrap metal management at Oak Ridge and future challenges and opportunities are discussed.

244 (CONF-931095–44) **Mixed-waste treatment–What about the residuals?: A comparison of MSO and incineration.** Carlson, T. (Chem-Nuclear Geotech, Inc., Grand Junction, CO (United States)); Carpenter, C.; Cummins, L.; Haas, P.; MacInnis, J.; Maxwell, C. Oak Ridge National Lab., TN (United States). 17 Sep 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;AC04-86ID12584. From Department of Energy environmental remediation conference; Augusta, GA (United States); 24-28 Oct 1993. Order Number DE94002444. Source: OSTI; NTIS; INIS; GPO Dep.

Incineration currently is the best demonstrated available technology for the large inventory of U.S. Department of Energy (DOE) mixed waste. However, molten salt oxidation (MSO) is an alternative thermal treatment technology with the potential to treat a number of these wastes. Of concern for both technologies is the final waste forms, or residuals, that are generated by the treatment process. An evaluation of the two technologies focuses on 10 existing DOE waste streams and current hazardous-waste regulations, specifically for the delisting of derived-from residuals. Major findings include that final disposal options are more significantly impacted by the type of waste treated and existing regulations than by the type of treatment technology; typical DOE waste streams are not good candidates for delisting; and mass balance calculations indicate that MSO and incineration generate similar quantities (dry) and types of residuals.

245 (DOE/AL/62350–36PF) **Long-term surveillance plan for the Lowman, Idaho, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001475. Source: OSTI; NTIS; INIS; GPO Dep.

This report supersedes report number DOE/AL-350212.0000.

The long-term surveillance plan (LTSP) for the Lowman, Idaho, Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site describes the surveillance activities for the Lowman disposal cell. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This preliminary final LTSP is being submitted to the US Nuclear Regulatory Commission (NRC) as a requirement for issuance of a general license for custody and long-term care for the disposal site. The general license requires that the disposal cell be cared for in accordance with the provisions of this LTSP. The LTSP documents whether the land and interests are owned by the United States or an Indian tribe, and describes, in detail, how the long-term care of the disposal site will be carried out through the UMTRA Project long-term surveillance program. The Lowman, Idaho, LTSP is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program, (DOE, 1992).

246 (DOE/EM–0099) **EM International: Volume 1.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Jul 1993. 44p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001564. Source: OSTI; NTIS; GPO Dep.

It is the intent of EM International to describe the Office of Environmental Restoration and Waste Management's (EM's) various roles and responsibilities within the international community. Cooperative agreements and programs, descriptions of projects and technologies, and synopses of visits to international sites are all highlighted in this semiannual journal. Focus on EM programs in this issue is on international collaboration in vitrification projects. Technology highlights covers: in situ sealing for contaminated sites; and remote sensors for toxic pollutants. Section on profiles of countries includes: Arctic contamination by the former Soviet Union, and EM activities with Germany–cooperative arrangements.

247 (DOE/ER/13951–5) **Zircons and fluids: An experimental investigation with applications for radioactive waste disposal: Stability of zircons: Progress report, January 1992–December 1992.** Sinha, A.K. Virginia Polytechnic Inst. and State

Univ., Blacksburg, VA (United States). Dept. of Geological Sciences. [1992]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER13951. Order Number DE94000657. Source: OSTI; NTIS; GPO Dep.

The long-term stability of nuclear waste forms or barriers is related to changes in physical properties of the material induced through radiation damage and subsequent changes in solubility. Investigations conducted on natural zircons ($ZrSiO_4$) supports a positive correlation between level of alpha damage and fluid composition to enhanced levels of corrosion. In this report we present preliminary data on the nature and rate of the solution process involving < 600,000 year-old zircons being affected by natural fluids in geyser fields of Yellowstone National Park. We also summarize our continuing activity by including in this report articles that have been published or are in press in refereed journals.

248 (DOE-HMIP-RR–92.12) **Liquid effluent treatment using inorganic absorbers.** Mellow, D.G. (NNC Ltd. (United Kingdom). Engineering Development Centre); Handy, B.J.; Walker, R.N.; Fitzgerald, J.R.; Dean, M.J. Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. 1992. 103p. Contract PECD-7/9/551;NNC C8121. (NNC-EDC–91/94.). Order Number DE94604665. Source: OSTI; NTIS (US Sales Only); INIS.

The use of inorganic absorbers for the removal of a number of specified elements from aqueous waste streams has been studied. A worldwide review of the literature on the subject has been carried out and a number of processes identified at various stages of development, from the experimental to the fully developed industrial scale. The processes have been reduced to two major types; precipitation techniques, both seeded and unseeded and ion exchange. The chemical aspects of the use of such materials have been examined with regard to the processes and the nuclides in question. A comparative costing exercise has been carried out on typical processes examining plant, process and disposal costs, and has shown that one of the over-riding factors in deciding the economics of precipitation processes is the subsequent dewatering stage; because of the relatively low amounts of waste produced ion-exchange processes involving the use of columns have been found to have the lowest overall costs. Finally, a number of gaps in the present state of knowledge in this field have been identified and a number of recommendations are made. (author).

249 (DOE-HMIP-RR–92.057) **Modelling of rock mass response to glaciation in the Dounreay area, Scotland.** Errington, M. Dames and Moore International, Twickenham (United Kingdom). 1992. 95p. Sponsored by Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Contract PECD-7/9/436. (TR-D/M–21.). Order Number DE94606148. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents the results of a modelling study undertaken to investigate the potential response of a faulted rock mass to glacial loading. The modelled rock mass was a 10X10X10 km region around Dounreay. This site was selected as one of the two locations under consideration by UK Nirex Ltd for a deep repository for the disposal of low and intermediate radioactive waste. The model selected for the study was 3DEC, a distinct element code which has been used in similar modelling studies in Sweden. A set of seven regional fractures and five rock types were identified in the region to be modelled. Properties for these discontinuities and media were derived from published information where possible or from data for similar regimes. A number of parameters were selected for sensitivity studies. The results of the study form a useful basis for assessing the extent of fracture movement which might be expected in the region modelled. Site-specific results cannot be extended to other areas but the results of the sensitivity study indicate those parameters which have a significant effect on the modelled behaviour of the rock mass and which would thus require site-specific determination. (Author).

250 (DOE-HMIP-RR–92.102) **Site investigation requirements for a deep repository.** Farmer, I.W. Farmer (I.W.) and Partners Ltd., Newcastle upon Tyne (United Kingdom). Mar 1992. 86p. Sponsored by Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Contract PECD-7/9/590. Order Number DE94606149. Source: OSTI; NTIS (US Sales Only); INIS.

Techniques currently available for measuring geotechnical parameters needed in the design, construction and assessment of a deep underground repository have been critically examined. These techniques have been considered under four main areas: definition of the rock discontinuity structure, definition of the in-situ stress distribution in the rock mass, estimation of the geomechanical characteristics of the rock mass, and estimation of flow and transport characteristics of the rock mass. The review concludes that generally rocks and rock masses are not well characterised by tests from cores or from boreholes and gives reason to support this view. The only parameters which can be measured accurately are laboratory index properties which are useful only in a comparative assessment of different rock types. Finally the review concludes that the only way to obtain useful data on rock behaviour is through large pilot scale tests with appropriate and controlled boundary conditions conducted preferably in the potential host strata. (author).

251 (DOE-HMIP-RR–93.034) **Review of excavation methods and their implications for the near-field barrier of a deep underground repository: Final report.** Young, D.K. Mott MacDonald Ciril Ltd., Croydon (United Kingdom). 1993. [226p.] Sponsored by Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Contract PECD-7/9/588. (GEO–2826.). Order Number DE94606150. Source: OSTI; NTIS (US Sales Only); INIS.

The report reviews excavation techniques for use in the construction of deep underground radioactive waste repositories, gives a summary of responses of the host rock to excavation and the means of measuring that response and discusses techniques for predicting that response. The review of excavation techniques included technical developments and current practice. To this end an extensive database was developed reviewing major excavations in rock types relevant to disposal and the techniques employed. Creation of an underground opening alters the properties of the rock mass around it. This study identifies stress, displacement, rock mass deformability and permeability as key parameters and reviews how they may be determined. Finally the report discusses the techniques available for predicting the behaviour of the near-field host rock. This concentrates on methods of numerical analysis since existing empirical or analytical methods are not considered suitable. (author).

252 (DOE/MWIP–3-Vol.1) **Technical area status report for low-level mixed waste final waste forms: Volume 1.** Mayberry, J.L. (Science Applications International Corp., Idaho Falls, ID (United States)); DeWitt, L.M.; Darnell, R. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development; Science Applications International Corp., Idaho Falls, ID (United States); Final Waste Forms Working Group, Washington, DC (United States). Aug 1993. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-92EW30030 ;AC05-84OR21400. (ORNL/M–2990/Vol.1). Order Number DE93040594. Source: OSTI; NTIS; INIS; GPO Dep.

The Final Waste Forms (FWF) Technical Area Status Report (TASR) Working Group, the Vitrification Working Group (WG), and the Performance Standards Working Group were established as subgroups to the FWF Technical Support Group (TSG). The FWF TASR WG is comprised of technical representatives from most of the major DOE sites, the Nuclear Regulatory Commission (NRC), the EPA Office of Solid Waste, and the EPA's Risk Reduction Engineering Laboratory (RREL). The primary activity of the FWF TASR Working Group was to investigate and report on the current status of FWFs for LLNM in this TASR. The FWF TASR Working Group determined the current status of the development of various waste forms described above by reviewing selected articles and technical reports, summarizing data, and establishing an initial set of FWF characteristics to be used in evaluating candidate FWFS; these characteristics are summarized in Section 2. After an initial review of available information, the FWF TASR Working Group chose to study the following groups of final waste forms: hydraulic cement, sulfur polymer cement, glass, ceramic, and organic binders. The organic binders included polyethylene, bitumen, vinyl ester styrene,

epoxy, and urea formaldehyde. Section 3 provides a description of each final waste form. Based on the literature review, the gaps and deficiencies in information were summarized, and conclusions and recommendations were established. The information and data presented in this TASR are intended to assist the FWF Production and Assessment TSG in evaluating the Technical Task Plans (TTPs) submitted to DOE EM-50, and thus provide DOE with the necessary information for their FWF decision-making process. This FWF TASR will also assist the DOE and the MWIP in establishing the most acceptable final waste forms for the various LLMW streams stored at DOE facilities.

253 (DOE/NV/10576–T6) **Critical comments on the US Environmental Protection Agency Standards 40 CFR 191.** Pflum, C.G. (Science Applications International Corp., Las Vegas, NV (United States)); Van Konynenburg, R.A.; Krishna, P. Science Applications International Corp., Las Vegas, NV (United States). 14 Jan 1993. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-87NV10576. Order Number DE94000959. Source: OSTI; NTIS; INIS; GPO Dep.

This paper is about the US Environmental Protection Agency (EPA) "Environmental Standards for the Disposal of Spent Nuclear Fuel, High-Level and Transuranic Wastes," 40 CFR 191. These standards regulate the disposal of radioactive wastes in geologic repositories. Currently, two repository sites are under investigation: The Waste Isolation Pilot Plant (WIPP) site, located near Carlsbad, New Mexico, may become the repository for defense-generated transuranic waste (TRU); and the Yucca Mountain site, located near Las Vegas, Nevada, may become the repository for spent reactor fuel and a small amount of reprocessing waste (hereinafter called high-level radioactive waste or HLW). The paper was written for readers who have an interest in 40 CFR 191 but do not have the time or inclination to ponder the technical details.

254 (DOE/NV/10872–T84) **Quarterly progress report on the DOE Waste Package project at the University of Nevada, Las Vegas, July 1, 1993 through September 30, 1993.** Ladkany, S.G. Nevada Univ., Las Vegas, NV (United States). 1993. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94002515. Source: OSTI; NTIS; GPO Dep.

Progress reports are presented for the following tasks: overview and progress of waste package project and container design; waste container design considerations (criticality analysis, experimental drift model); waste container alternate design considerations; thermal simulation of high level nuclear waste canister emplacement; structural analysis and design of nuclear waste package canister; robotic manipulation of the nuclear waste container; investigation of stress in a circular tunnel due to overburden & thermal loading of horizontally placed 21PWR multi-purpose canisters; investigation of faulted tunnel models by combined photoelasticity and finite element analysis; and transport phenomena in the near field.

255 (DOE/OR/00033–T544) **Determination of vapor-liquid equilibrium data and decontamination factors needed for the development of evaporator technology for use in volume reduction of radioactive waste streams.** Betts, S.E. (California Univ., Santa Barbara, CA (United States)). Oak Ridge Inst. for Science and Education, TN (United States); California Univ., Santa Barbara, CA (United States). [1993]. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000838. Source: OSTI; NTIS; INIS; GPO Dep.

A program is currently in progress at Argonne National Laboratory to evaluate and develop evaporator technology for concentrating radioactive waste streams. By concentrating radioactive waste streams, disposal costs can be significantly reduced. To effectively reduce the volume of waste, the evaporator must achieve high decontamination factors so that the distillate is sufficiently free of radioactive material. One technology that shows a great deal of potential for this application is being developed by LICON, Inc. In this program, Argonne plans to apply LICON's evaporator designs to the processing of radioactive solutions. Concepts that need to be incorporated into the design of the evaporator include, criticality safety, remote operation and maintenance, and materials of construction. To design an effective process for concentrating waste streams, both solubility and vapor-liquid equilibrium data are needed. The key issue, however, is the high decontamination factors that have been demonstrated by this equipment. Two major contributions were made to this project. First, a literature survey was completed to obtain available solubility and vapor-liquid equilibrium data. Some vapor-liquid data necessary for the project but not available in the literature was obtained experimentally. Second, the decontamination factor for the evaporator was determined using neutron activation analysis (NAA).

256 (DOE/RL–93-44) **State waste discharge permit application for the 200 Area Effluent Treatment Facility and the State-Approved Land Disposal Site.** Westinghouse Hanford Co., Richland, WA (United States); Science Applications International Corp., Richland, WA (United States). Aug 1993. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041189. Source: OSTI; NTIS; INIS; GPO Dep.

Application is being made for a permit pursuant to Chapter 173–216 of the Washington Administrative Code (WAC), to discharge treated waste water and cooling tower blowdown from the 200 Area Effluent Treatment Facility (ETF) to land at the State-Approved Land Disposal Site (SALDS). The ETF is located in the 200 East Area and the SALDS is located north of the 200 West Area. The ETF is an industrial waste water treatment plant that will initially receive waste water from the following two sources, both located in the 200 Area on the Hanford Site: (1) the Liquid Effluent Retention Facility (LERF) and (2) the 242-A Evaporator. The waste water discharged from these two facilities is process condensate (PC), a by-product of the concentration of waste from DSTs that is performed in the 242-A Evaporator. Because the ETF is designed as a flexible treatment system, other aqueous waste streams generated at the Hanford Site may be considered for treatment at the ETF. The origin of the waste currently contained in the DSTs is explained in Section 2.0. An overview of the concentration of these waste in the 242-A Evaporator is provided in Section 3.0. Section 4.0 describes the LERF, a storage facility for process condensate. Attachment A responds to Section B of the permit application and provides an overview of the processes that generated the wastes, storage of the wastes in double-shell tanks (DST), preliminary treatment in the 242-A Evaporator, and storage at the LERF. Attachment B addresses waste water treatment at the ETF (under construction) and the addition of cooling tower blowdown to the treated waste water prior to disposal at SALDS. Attachment C describes treated waste water disposal at the proposed SALDS.

257 (DOE/RL–93-48) **White Bluffs Pickling Acid Cribs expedited response action proposal.** USDOE Richland Operations Office, WA (United States). Jul 1993. 26p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001702. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) recommended in a letter dated March 4, 1992 (Attachment 1) that the US Department of Energy (DOE) prepare an expedited response action (ERA) for the White Bluffs Pickling Acid Cribs Site. The lead regulatory agency for this ERA is the EPA, with Ecology providing support. The goal of this ERA is to reduce the potential of any residual contaminant migration from the cribs to the soil column and groundwater. The cribs are the only waste site within the 100-IU-5 operable unit. Since the operable unit is surrounded by other waste units, tracing the potential groundwater contamination from the 100-IU-5 operable unit for this ERA would not be effective. Groundwater will be investigated with the 100-IU-2 operable unit. This ERA proposal presents the characterization data from the site investigations conducted in November of 1992. This information is evaluated to present the best method for reducing potential of contaminant migration from the disposal unit, ensuring both protection of human health and the environment. The ERA proposal will undergo a public review. EPA and Ecology will issue an Action Agreement Memorandum after comment resolution. This Action Memorandum may authorize implementation of the ERA proposal's recommended alternative. The ERA may also provide a No Further Action Interim Record of Decision (IROD) of the 100-IU-5 operable unit.

258 (DOE/RL–93-70) **Waste analysis plan for confirmation or completion of Tank Farms backlog waste designation.**

USDOE Richland Operations Office, WA (United States). Aug 1993. 123p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93041134. Source: OSTI; NTIS; INIS; GPO Dep.

This waste analysis plan satisfies the requirements of Item 3 of Ecology Order 93NM-201 as amended per the Settlement Agreement. Item 3 states: "Within forty (40) calendar days of receipt of this Order, the US Department of Energy Richland Operations (DOE-RL) and Westinghouse Hanford Company (WHC) shall provide Ecology with a plan for review and approval detailing the established criteria and procedures for waste inspection, segregation, sampling, designation, and repackaging of all containers reported in item #1. The report shall include sampling plan criteria for different contaminated media, i.e., soils, compactable waste, high-efficiency particular air (HEPA) filters, etc., and a schedule for completing the work within the time allowed under this Order." Item 3 was amended per the Settlement Agreement as follows: "In addition to the waste inspection plans for the "unknowns" previously provided and currently being supplemented, DOE-RL and WHC shall provide a draft waste analysis plan for the containers reported in Item 1 of the Order to Ecology by July 12, 1993. A final, DOE-RL approved waste analysis plan shall be submitted to Ecology by September 1, 1993, for Ecology's written approval by September 15, 1993." Containers covered by the Order, Settlement Agreement, and this waste analysis plan consist of all those reported under Item 1 of the Order, less any containers that have been identified in unusual occurrences reported by Tank Farms. This waste analysis plan describes the procedures that will be undertaken to confirm or to complete designation of the solid waste identified in the Order.

259 (DOE/WIPP–91-058) **Radionuclide inventory for the Waste Isolation Pilot Plant.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1991]. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94000734. Source: OSTI; NTIS; INIS; GPO Dep.

This report updates the information previously submitted in the draft report DOE/WIPP 88-005, Radionuclide Source Term for the WIPP, dated 1987 (reference 1). The information in this report provides the projected radionuclide inventory at the WIPP based on the projected waste receipts through the year 2013. The information is based on the 1991 TRU Program Data submittals for the Integrated Data Base (DOE/RW-0006, Rev. 7) from each of the DOE sites generating or storing TRU waste for shipment to the WIPP. The data is based on existing characterization data on the waste in interim storage, waste estimates based on projected programs during the 1991 through 2013 time period, projected treatment processes required to meet WIPP Waste Acceptance Criteria (WAC), and a projection of the waste that will be declared low level waste when it is assayed as part of the certification program for waste shipments to WIPP. This data will serve as a standard reference for WIPP programs requiring radionuclide data, including safety programs, performance assessment, and regulatory compliance. These projections will continue to be periodically updated as the waste data estimates are refined by the generator sites as they participate in the annual update of the Integrated Data Base (IDB).

260 (DOE/WIPP–93-019-Vol.2) **Geotechnical field data and analysis report, July 1991–June 1992: Volume 2.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1992]. 493p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE93041191. Source: OSTI; NTIS; INIS; GPO Dep.

The Geotechnical Field Data and Analysis Report presents the data for the assessments of the geotechnical status of the Waste Isolation Pilot Plant (WIPP). During the period of shaft sinking and construction of the principal underground access and experimental areas, reporting was on a quarterly basis. Since 1987, reporting has been carried out annually because excavation of the waste storage panels will take place more slowly and over an extended period. This report presents the data collected up to June 30, 1992. This report focuses on the presentation of geotechnical data from the various underground facilities including the shafts, shaft stations, access drifts, test rooms, and waste storage areas. It also describes the techniques used to acquire the data and the performance history of the instruments.

261 (DOE/WIPP–93-033) **The current bases for roof fall prediction at WIPP and a preliminary prediction for SPDV Room 2.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Oct 1993. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94001838. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the current bases for roof fall prediction at the Waste Isolation Pilot Plant (WIPP) and a preliminary prediction of the date of a roof fall in SPDV Test Room 2. The ability to correctly assess the stability of the excavations at the WIPP is necessary to protect the safety of site workers, the environment, and the integrity of in situ experiments that use transuranic mixed waste. Roof fall is the extreme case of instability. Although roof falls have been allowed to occur unused, barricaded rooms so that the pre-collapse behavior of this room could be studied. This document presents a discussion of some deformation mechanisms that can be expected around excavations in bedded salt at the WIPP. The geomechanical instrument data and fracture maps from the Site and Preliminary Design Validation (SPDV) room area have been analyzed to determine the deformation history of the rooms and to identify precursors to the SPDV Room 1 roof fall. The deformation history of the excavations as recorded by the instruments was then correlated with these proposed deformation mechanisms, providing a basis for prediction of roof falls in other locations. Finally, the means used at the WIPP to identify and monitor unstable ground are discussed. Throughout this document, "Room 1 " and "Room 2" refer to SPDV Rooms 1 and 2 unless otherwise stated.

262 (EGG-WTD–10813) **Test plan for Digface Chemical and Radiation Assay System.** Akers, D.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002881. Source: OSTI; NTIS; INIS; GPO Dep.

The Digface Chemical and Radiation Assay System (CRAS) Project will develop a sensor using Prompt Gamma Neutron Activation Analysis (PGNAA) that can detect the present of hazardous chemicals and radioactive materials. The CRAS is being designed for in situ assay of closed drums and contaminated soils for gamma-ray emitting radionuclides and hazardous elements. The CRAS is based upon the use of ^{252}Cf PGNAA with a germanium gamma-ray spectrometer as the analyzer. Tasks being performed include determining detection limits for a number of hazardous chemicals and assessing matrix and transmission effects through soil. Initial analyses suggest that the technique is applicable to a number of hazardous materials such as trichloroethane and carbon tetrachloride.

263 (ETDE-IT–93-238) **Treatment and conditioning of HLLW stored at ENEA's reprocessing pilot plants.** Luce, A. (ENEA, Casaccia (Italy). Area Nucleare); Troiani, F.; Momo, S.; Di Pace, L.; Risoluti, P. 1992. 9p. Order Number DE94716573. Source: OSTI; NTIS (US Sales Only).

At the ENEA (Italian Agency for Energy, New Technology and the Environment) reprocessing pilot plants some 115 cubic meters of aged first cycle reprocessing aqueous wastes are stored, produced during the reprocessing of MTR, CANDU and Elk River spent fuels. A preliminary chemical treatment to separate the high active fraction and the cementation of the low active fraction is selected. The chemical processes, developed both on hot laboratory and inactive pilot plant scales, are described. The plant under design, to be realized at the EUREX site, will be suitable to implement the described processes, allowing the cementation of the low level fraction with a mobile unit. A small size vitrification unit, based on the ceramic melter technology, is considerated for conditioning the high active sludge fraction.

264 (FEMP–2307) **The Fernald Waste Recycling Program.** Motl, G.P. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 26 Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-931095–47: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002556. Source: OSTI; NTIS; INIS; GPO Dep.

Recycling is considered a critical component of the waste disposition strategy at the Fernald Plant. It is estimated that 33 million cubic feet of waste will be generated during the Fernald cleanup. Recycling some portion of this waste will not only conserve natural resources and disposal volume but will, even more significantly, support the preservation of existing disposition options such as off-site disposal or on-site storage. Recognizing the strategic implications of recycling, this paper outlines the criteria used at Fernald to make recycle decisions and highlights several of Fernald's current recycling initiatives.

265 (HW–43561-RD) **Purex waste facility scope design – 241-AX.** Stivers, H.W. Hanford Atomic Products Operation, Richland, WA (United States). 20 Jun 1956. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040985. Source: OSTI; NTIS (US Sales Only); GPO Dep.

It is planned for the Purex plant to be the base load plant and therefore it will not be effected by small changes in production schedules. It is of utmost importance to have adequate waste storage capacities at Purex to handle all conceivable production demands and to permit flexibility in semi-permanent storage of self-boiling wastes without jeopardizing production schedules, and diminishing safety regulations, or reducing operability. The purpose of this report is to present the design scope and the fundamental requirements for a new Purex waste storage tank farm to be designated as 241-AX.

266 (HW–57686) **Solidification of high level wastes Part 1, Evaporation and calcination of Purex IWW–volatility and leachability of fission products.** Barton, G.B. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 4 Aug 1959. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041095. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The basic objective of the storage of radioactive wastes is to protect humanity from: (1) direct radiation, (2) contamination of food and water supplies, and (3) contamination of mineral resources. There have been many proposals for the disposal of high level liquid wastes from chemical plants processing nuclear fuels. These include our present Hanford system of tank storage; disposal to deep wells, such as the oil industry uses for discard of brines they pump; storage in salt caverns; disposal to selected geological formations, such as salt domes and anticlines, or impermeable substances, such as clay, etc.; or release to the depths of the ocean. Only the use of tanks and salt caverns can be considered as storage systems. The latter is essentially a dry mine into which material would be placed as solids or packaged liquids. There is no control over the movement of activity with the other disposal methods. This is also potentially true for tank storage should corrosion or other damage cause leakage. Storage of highly radioactive wastes pose a problem in handling the heat generated by fission product decay. Thus, it is advantageous to look for a substance of high density and high thermal conductivity to help dissipate the heat generated and preclude excessive temperature rise within the stored mass. This investigation, dated August 4, 1959 is based on the assumption that the formation of a solid – particularly a "non-leachable" solid – is the preferable method for ultimate storage of these high-activity wastes. The basis for this choice is demonstrated by considering the magnitude of the hazards involved.

267 (HW–69011) **Project CGC-897–Title I design, fission product storage in B-Plant.** Caudill, H.L.; Zahn, L.L. Jr. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 3 Apr 1961. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001142. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A previous study described proposed facilities at B-Plant which integrate future fission product and waste calcination activities. However, in the reactivation of B-Plant in accordance with this study, heavy expenditures, above budgeted funds, would be required at an early date for Phase 1 process changes coupled with general rehabilitation work and facilities for updating of radiological control. Since waste calcination activities in B-Plant are not scheduled until Fiscal Year 1966, the expense of B-Plant rehabilitation items would be borne solely by the Fission Product Program. This report provides the Title I design of Phase 1 fission product facilities at B-Plant which can be provided with minimum capital expenditures. The facility described in this report accomplishes the overall processing objectives of the facility, namely the recovery and storage of crude strontium-90 and rare-earth concentrates, although certain B-Plant improvements are deferred to later phases of the Fission Product and Waste Calcination Programs.

268 (INIS-BR–3148, pp. 544-546) **Management of radioactive wastes at UFRJ.** Soares, J.C.A.R. (Universidade Federal, Rio de Janeiro, RJ (Brazil)); Anjos, M.J.; Mattos, J.A.; Souza, H.V.; Castro, C.R.F.; Sarquis, A.C.R.; Padilha Filho, L.G.; Borges, J.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Since 1987, when the radiological Control Service of UFRJ was created, a radioprotection program has been developed, including all the installations and employees involved with ionizing radiations activities. Recently, a more systematic approach for radioactive wastes produced, monthly/annual manipulated activities, procedure and capacity of storage, and forms of release to the environment. Actual situation is not distant from that required by the norms about, but there area some critical situations that deserved emergency corrections. A plan for waste management is being prepared to be executed in the short and middle terms. (author).

269 (INIS-GB–505) **Radioactive waste management - a safe solution.** Department of the Environment, London (United Kingdom). [1993]. 12p. Order Number DE94606151. Source: OSTI; NTIS (US Sales Only); INIS.

This booklet sets out current United Kingdom government policy regarding radioactive waste management and is aimed at reassuring members of the public concerned about the safety of radioactive wastes. The various disposal or, processing or storage options for low, intermediate and high-level radioactive wastes are explained and sites described, and the work of the Nuclear Industry Radioactive Waste Executive (NIREX) is outlined. (UK).

270 (INIS-mf–13632) **The problem of nuclear wastes. A possible point of conflict between Mexico and the United States.** Rosas Poblano, A. Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Ciencias Politicas y Sociales. 1993. 182p. (In Spanish). Order Number DE94603559. Source: OSTI; NTIS (US Sales Only); INIS.

The objectives of this research were: (a) To analyse the problem of nuclear wastes, and the importance of their safe handling; (b) To investigate the best and safest technologies for the treatment of radioactive wastes and two relevant international laws or regulations; (c) To study whether the wastes produced in the United States represent an environmental problem for Mexico.

271 (ISO–100) **Waste Management Technical Manual.** Buckingham, J.S. (ed.). Isochem Inc., Richland, WA (United States). 31 Aug 1967. 958p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93019700. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This Manual has been prepared to provide a documented compendium of the technical bases and general physical features of Isochem Incorporated's Waste Management Program. The manual is intended to be used as a means of training and as a reference handbook for use by personnel responsible for executing the Waste Management Program. The material in this manual was assembled by members of Isochem's Chemical Processing Division, Battelle Northwest Laboratory, and Hanford Engineering Services between September 1965 and March 1967. The manual is divided

into the following parts: Introduction, contains a summary of the overall Waste Management Program. It is written to provide the reader with a synoptic view and as an aid in understanding the subsequent parts; Feed Material, contains detailed discussion of the type and sources of feed material used in the Waste Management Program, inciuding a chapter on nuclear reactions and the formation of fission products; Waste Fractionization Plant Processing, contains detailed discussions of the processes used in the Waste Fractionization Plant with supporting data and documentation of the technology employed; Waste Fractionization Plant Product and Waste Effluent Handling, contains detailed discussions of the methods of handling the product and waste material generated by the Waste Fractionization Plant; Plant and Equipment, describes the layout of the Waste Management facilities, arrangement of equipment, and individual equipment pieces; Process Control, describes the instruments and analytical methods used for process control; and Safety describes process hazards and the methods used to safeguard against them.

272 (JINR–18-92-303) **Simulation of electronuclear method of atomic energy production and radioactive waste transmutation.** Tolstov, K.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 11p. (In Russian). Order Number DE94606145. Source: OSTI; NTIS (US Sales Only); INIS.

Prospects of electronuclear method of atomic energy production and radioactive waste transformation are discussed. The work is based on data obtained at the JINR synchrophasotron, which are devoted to neutron generation by light nuclei in massive lead block. 20 refs.; 5 figs.; 3 tabs.

273 (KTM/E-B–147) **JYT - Publicly financed nuclear waste management research programme: Annual Report 1992.** Vuori, S. (ed.). Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. Jun 1993. 147p. Order Number DE94606152. Source: OSTI; NTIS; INIS.

Finland's energy research programmes.

The nuclear waste management research in Finland is funded both by the state and the utilities (represented in cooperation by the Nuclear Waste Commission of the Finnish power companies). A coordinated research programme (JYT) comprising the publicly financed waste management studies was started in 1989 and continues until 1993. The utilities continue to carry out a parallel research programme according to their main financial and operational responsibility for nuclear waste management. The research programme covers the following main topic areas: (1) Bedrock characteristics, groundwater and repository, (2) Release and transport of radionuclides, (3) Performance and safety assessment of repositories, and (4) Waste management technology and costs.

274 (LA–12542-MS) **Geologic evaluation of six nonwelded tuff sites in the vicinity of Yucca Mountain, Nevada for a surface-based test facility for the Yucca Mountain Project.** Broxton, D.E. (Los Alamos National Lab., NM (United States)); Chipera, S.J.; Byers, F.M. Jr.; Rautman, C.A. Los Alamos National Lab., NM (United States). Oct 1993. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94000698. Source: OSTI; NTIS; INIS; GPO Dep.

Outcrops of nonwelded tuff at six locations in the vicinity of Yucca Mountain, Nevada, were examined to determine their suitability for hosting a surface-based test facility for the Yucca Mountain Project. Investigators will use this facility to test equipment and procedures for the Exploratory Studies Facility and to conduct site characterization field experiments. The outcrops investigated contain rocks that include or are similar to the tuffaceous beds of Calico Hills, an important geologic and hydrologic barrier between the potential repository and the water table. The tuffaceous beds of Calico Hills at the site of the potential repository consist of both vitric and zeolitic tuffs, thus three of the outcrops examined are vitric tuffs and three are zeolitic tuffs. New data were collected to determine the lithology, chemistry, mineralogy, and modal petrography of the outcrops. Some preliminary data on hydrologic properties are also presented. Evaluation of suitability of the six sites is based on a comparison of their geologic characteristics to those found in the tuffaceous beds of Calico Hills within the exploration block.

275 (LA–12667-MS) **Future radioactive liquid waste streams study.** Rey, A.S. Los Alamos National Lab., NM (United States). Nov 1993. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001837. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides design planning information for the Radioactive Liquid Waste Treatment Facility (RLWTF). Predictions of estimated quantities of Radioactive Liquid Waste (RLW) and radioactivity levels of RLW to be generated are provided. This information will help assure that the new treatment facility is designed with the capacity to treat generated RLW during the years of operation. The proposed startup date for the RLWTF is estimated to be between 2002 and 2005, and the life span of the facility is estimated to be 40 years. The policies and requirements driving the replacement of the current RLW treatment facility are reviewed. Historical and current status of RLW generation at Los Alamos National Laboratory are provided. Laboratory Managers were interviewed to obtain their insights into future RLW activities at Los Alamos that might affect the amount of RLW generated at the Lab. Interviews, trends, and investigation data are analyzed and used to create scenarios. These scenarios form the basis for the predictions of future RLW generation and the level of RLW treatment capacity which will be needed at LANL.

276 (LALP–93-54) **Waste management at Los Alamos: Protecting our environment.** Los Alamos National Lab., NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001860. Source: OSTI; NTIS; INIS; GPO Dep.

This report consists of a broad overview of activities at Los Alamos National Laboratory (LANL). The following topics are discussed: The growth of the waste management group; what we do today; the mission of the waste management group; the liquid waste treatment section; the radioactive liquid waste project office; the chemical waste section; the radioactive waste section; and the technical support section.

277 (LA-UR–92-2577) **Preliminary modeling of moisture movement in the tuff beneath Mortandad Canyon, Los Alamos National Laboratory.** Geddis, A.M. (Arizona Univ., Tucson, AZ (United States). Dept. of Hydrology). Los Alamos National Lab., NM (United States). 5 Aug 1992. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000628. Source: OSTI; NTIS; INIS; GPO Dep.

An area of upper/middle Mortandad Canyon on the Los Alamos National Laboratory is modeled in cross-section. UNSAT2, a finite element model (FEM) is used to predict moisture movement. Hydraulic characteristics of the tuff are described by van Genuchten parameters determined from laboratory tests on cores taken from a borehole within the cross-section. Material properties are distributed horizontal planar in space to cover the solution domain with required initial conditions. An estimate of seepage flux from a thin perched alluvial aquifer into the upper surface of the tuff is taken from a lumped parameter model. Moisture redistribution for a ponded boundary condition and a larger flux is investigated. A composite simulation using material properties from two separate coreholes is also evaluated.

278 (LA-UR–93-1914) **Hydrologic studies of multilayered landfill covers for closure of waste landfills at Los Alamos, New Mexico.** Nyhan, J.W.; Langhorst, G.J.; Martin, C.E.; Martinez, J.L.; Schofield, T.G. Los Alamos National Lab., NM (United States). 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (LA-UR–93-3440;CONF-931095–1: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE93014459. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory examined water balance relationships for four different landfill cover designs containing engineered barriers. These field experiments were performed at Los Alamos, New Mexico, USA, in 1.0- by 10.0-m plots with downhill slopes of 5, 10, 15 and 25%. Field measurements of seepage, precipitation, interflow, runoff, and soil water content were collected in each of the 16 plots representing four slopes each with four cover designs: Conventional, EPA, Loam Capillary Barrier and Clay Loam Capillary Barrier. A seepage collection system was installed

beneath each cover design to evaluate the influence of slope length on seepage using a series of four metal pans filled with medium gravel that were placed end-to-end in the bottom of each field plot. An automated waterflow datalogging system was used to collect hourly seepage, interflow and runoff data and consisted of 100 100-liter tanks, each of which was equipped with an ultrasonic liquid-level sensor and a motor-operated ball valve used to drain the tank. Soil water content was routinely monitored every six hours at each of 212 locations throughout the 16 plots with time domain reflectrometry (TDR) techniques using an automated and multiplexed measurement system.

279 (LA-UR–93-2579) **Evaluation of in-plant neutron coincidence counters for the measurement of molten salt extraction residues.** Langner, D.G.; Russo, P.A.; Wachter, J.R. Los Alamos National Lab., NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930749–29: 34. annual meeting of the Institute of Nuclear Materials Management, Scottsdale, AZ (United States), 18-21 Jul 1993). Order Number DE93018552. Source: OSTI; NTIS; INIS; GPO Dep.

Americium is extracted from plutonium by a molten salt extraction (MSE) process. The residual americium-laden salts are a significant waste stream in this pyrochemical purification process. Rapid assay of MSE residues is desirable to minimize the exposure of personnel to these often high-level emissions. However, the quantitative assay of plutonium in MSE residues is difficult. Variable, unknown (a,n) rates and variable emitted-neutron energy spectra preclude the use of standard neutron coincidence counting techniques with old-generation neutron coincidence counters. Gamma-ray assay methods have not been successful with some residues because of random lumps of plutonium metal. In this paper, we present measurements of MSE residues with two state-of-the-art neutron coincidence counters at the Los Alamos Plutonium Processing Facility: an in-line counter built for the assay of bulk waste material and the pyrochemical multiplicity counter that underwent test and evaluation at that facility. Both of these counters were designed to minimize the effects on measurements of variations in the sample geometry and variable energy spectra of emitted neutrons. These results are compared to measurements made with an HLNCII and with a 20-yr-old in-line well counter. The latter two counters are not optimized in ft sense. We conclude that the newer counters provide significantly improved assay results. The pyrochemical multiplicity counter operated in the conventional coincidence mode provided the best assays overall.

280 (LA-UR–93-2895) **The Accelerator Transmutation of Waste (ATW) concept overview.** Dewey, H.J. Los Alamos National Lab., NM (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930601–29: American Nuclear Society (ANS) annual meeting, San Diego, CA (United States), 20-24 Jun 1993). Order Number DE94000812. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. RADIOACTIVE WASTES/transmutation; TRANSMUTATION; POWER GENERATION; ACCELERATORS; RADIOACTIVE WASTE PROCESSING; FISSION PRODUCTS; ACTINIDES

281 (LA-UR–93-2896) **Technologies for destruction of long-lived radionuclides in high-level nuclear waste: Overview and requirements.** Arthur, E.D. Los Alamos National Lab., NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930601–30: American Nuclear Society (ANS) annual meeting, San Diego, CA (United States), 20-24 Jun 1993). Order Number DE94000811. Source: OSTI; NTIS; INIS; GPO Dep.

This paper, and this topical session on Nuclear Waste Minimization, Management and Remediation, focuses on two nuclear systems, and their associated technologies, that have the potential to address concerns surrounding long-lived radionuclides in high-level waste. Both systems offer technology applicable to HLW from present light-water reactors (LWR). Additionally these systems represent advanced nuclear power concepts that have important features associated with integrated management of wastes, long-term fuel supplies, and enhanced safety. The first system is the Integral Fast Reactor (IFR) concept. This system incorporates a metal-fueled fast reactor coupled with chemical separations based on pyroprocessing to produce power while simultaneously burning long-lived actinide waste. IFR applications include burning of actinides from current LWR spent fuel and energy production in a breeder environment. The second concept, Accelerator Transmutation of Waste (ATW), is based upon an accelerator-induced intense source of thermal neutrons and is aimed at destruction of long-lived actinides and fission products. This concept can be applied to long-lived radionuclides in spent fuel HLW as well as a future fission power source built around use of natural thorium or uranium as fuels coupled with concurrent waste destruction.

282 (LA-UR–93-2944) **Status of development of actinide blanket processing flowsheets for accelerator transmutation of nuclear waste.** Dewey, H.J.; Jarvinen, G.D.; Marsh, S.F.; Schroeder, N.C.; Smith, B.F.; Villarreal, R.; Walker, R.B.; Yarbro, S.L.; Yates, M.A. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930913–35: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE93040092. Source: OSTI; NTIS; INIS; GPO Dep.

An accelerator-driven subcritical nuclear system is briefly described that transmutes actinides and selected long-lived fission products. An application of this accelerator transmutation of nuclear waste (ATW) concept to spent fuel from a commercial nuclear power plant is presented as an example. The emphasis here is on a possible aqueous processing flowsheet to separate the actinides and selected long-lived fission products from the remaining fission products within the transmutation system. In the proposed system the actinides circulate through the thermal neutron flux as a slurry of oxide particles in heavy water in two loops with different average residence times: one loop for neptunium and plutonium and one for americium and curium. Material from the Np/Pu loop is processed with a short cooling time (5-10 days) because of the need to keep the total actinide inventory, low for this particular ATW application. The high radiation and thermal load from the irradiated material places severe constraints on the separation processes that can be used. The oxide particles are dissolved in nitric acid and a quarternary, ammonium anion exchanger is used to extract neptunium, plutonium, technetium, and palladium. After further cooling (about 90 days), the Am, Cm and higher actinides are extracted using a TALSPEAK-type process. The proposed operations were chosen because they have been successfully tested for processing high-level radioactive fuels or wastes in gram to kilogram quantities.

283 (LA-UR–93-3291) **Thermal-hydraulic analysis of graphite tubes for the non-aqueous system of accelerator transmutation of nuclear waste.** Potter, R.C.; Venneri, F.; Trujillo, D.A. Los Alamos National Lab., NM (United States). 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930913–45: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE94000898. Source: OSTI; NTIS; INIS; GPO Dep.

Accelerator transmutation of nuclear waste offers exciting possibilities for the disposal of nuclear waste by converting it into more benign Species. The non-aqueous system discussed here contains the materials to be transmuted within a lithium-fluoride salt. The system consists of bundles of graphite tubes containing the salt Solution. The tubes are cooled as lithium flows across their exterior. These circular graphite tubes have an inner circular passage and an outer annulus. Natural convection within the tubes causes the salt to circulate. This paper deals with the thermal-hydraulics of the system; it does not consider the neutronics in detail. Heat transfer and fluid flow were modeled using a custom computer program the system behavior of an graphite tube. Different geometries were tried, while keeping the system volume the same, to determine an optimize graphite tube geometry. I considered both the parallel flow and the counterflow of the lithium coolant, and allowed limited boiling to occur to facilitate circulation. I achieved power densities as high as 200 W/cm^3 for the overall blanket.

284 (LA-UR–93-3404) **Electrolytic decontamination of conductive materials.** Nelson, T.O. (Los Alamos National Lab.,

NM (United States)); Campbell, G.M.; Parker, J.L.; Getty, R.H.; Hergert, T.R.; Lindahl, K.A.; Peppers, L.G. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–15: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000821. Source: OSTI; NTIS; GPO Dep.

Using the electrolytic method, the authors have demonstrated removal of Pu from contaminated conductive material. At EG&G Rocky Flats, they electrolytically decontaminated stainless steel. Results from this work show removal of fixed contamination, including the following geometries: planar, large radius, bolt holes, glove ports, and protruding studs. More specifically, fixed contamination was reduced from levels ranging > 1,000,000 counts per minute (cpm) down to levels ranging from 1,500 to < 250 cpm with the electrolytic method. More recently, the electrolytic work has continued at LANL as a joint project with EG&G. Impressively, electrolytic decontamination experiments on removal of Pu from oralloy coupons have shown decreases in swipable contamination that initially ranged from 500,000 to 1,500,000 disintegrations per minute (dpm) down to 0–2 dpm.

285 (LA-UR–93-3717) **Optimization of a packed bed reactor for liquid waste treatment.** Schmidt, C.A.; Brower, M.J.; Coogan, J.J.; Tennant, R.A. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931164–1: Annual meeting of the American Institute of Chemical Engineers, St. Louis, MO (United States), 7-12 Nov 1993). Order Number DE94002694. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe an optimization study of a packed bed reactor (PBR), developed for the treatment of hazardous liquid wastes. The focus is on the destruction of trichloroethylene (TCE). The PBR technology offers many distinct advantages over other processes: simple design, high destruction rates (99.99%), low costs, ambient pressure operation, easy maintenance and scaleability. The cost effectiveness, optimal operating parameters and scaleability were determined. As a second stage of treatment, a silent discharge plasma (SDP) reactor was installed to further treat offgases from the PBR. A primary advantage of this system is closed loop operation, where exhaust gases are continuously recycled and not released into the atmosphere.

286 (LA-UR–93-3800) **Simulation and rheological analysis of Hanford Tank 241-SY-101.** Sams, E.C.; Tennant, R.A.; Piccola, J.P. Jr. Los Alamos National Lab., NM (United States). Oct 1993. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002724. Source: OSTI; NTIS; INIS; GPO Dep.

Rheological characterization and small scale simulation of Hanford Tank 241-SY-101 has been initiated to aid in the remediation efforts for the Department of Energy Hanford Site. The study has been initiated in response to growing concerns about the potential flammability hazard pertaining to the periodic release of up to 10,000 cubic feet of hydrogen, nitrous oxide, nitrogen, and ammonia gases. Various stimulants emulating the radioactive waste stored in this tank have been used to ascertain the rheological parameters of the waste, simulate the ongoing processes of gas generation and release phenomenon inside the tank, and determine the feasibility of jet mixing to achieve a controlled release of the gas mixture.

287 (NUREG–1444) **Site decommissioning management plan.** Fauver, D.N.; Austin, J.H.; Johnson, T.C.; Weber, M.F.; Cardile, F.P.; Martin, D.E.; Caniano, R.J.; Kinneman, J.D. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Low-Level Waste Management and Decommissioning. Oct 1993. 169p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The Nuclear Regulatory Commission (NRC) staff has identified 48 sites contaminated with radioactive material that require special attention to ensure timely decommissioning. While none of these sites represent an immediate threat to public health and safety they have contamination that exceeds existing NRC criteria for unrestricted use. All of these sites require some degree of remediation, and several involve regulatory issues that must be addressed by the Commission before they can be released for unrestricted use and the applicable licenses terminated. This report contains the NRC staff's strategy for addressing the technical, legal, and policy issues affecting the timely decommissioning of the 48 sites and describes the status of decommissioning activities at the sites.

288 (NWPO-TR–015-90) **Quaternary geology and neotectonic activity along the Fish Lake Valley Fault Zone, Nevada and California.** Sawyer, T.L. Nevada Nuclear Waste Project Office, Carson City, NV (United States). Aug 1990. 464p. Thesis submitted to the University of Nevada, Reno. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG08-85NV10461. Order Number DE93041190. Source: OSTI; NTIS; INIS; GPO Dep.

The right-divergent Fish Lake Valley fault zone (FLVFZ), a 80 KM-long component of the northern Death Valley fault system, comprises contemporaneous NW-striking dextral faults, N-striking normal faults, NE-striking left(?)-divergent faults, and locally WNW-striking contractional faults. The fault zone terminates in a horsetail splay where the minimum right-slip rate is 0.7–0.8 mm/yr. The styles and rates of faulting are based on a sequence of morphostratigraphic units disrupted by the FLVFZ. Geomorphic surface correlations, radiocarbon analyses, tephrochronology, and soil development studies were used to estimate unit ages. Paleoseismicity studies have identified three discrete slip events in the last 4 to 2 ka on the northern FLVFZ. The last two significant events were similar, suggesting a characteristic earthquake behavior and magnitudes of 7.1 ± 0.3. The last large event occurred 1 ka (±0.6, −0.5) and comparable events have repeated every 1.1 Ka (+2.3, −0.5). Source structure characteristics suggest a MCE of M 7.3 ± 0.4.

289 (NWPO-TR–020-93) **State of Nevada review of Phase 1 of the INTRAVAL Project.** Lehman, L. Lehman (L.) and Associates, Inc., Burnsville, MN (United States). Aug 1992. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG08-85NV10461. Order Number DE93041148. Source: OSTI; NTIS; INIS; GPO Dep.

The INTRAVAL Project which started in October, 1987, was designed to be an international cooperation project and is managed by the Swedish Nuclear Power Inspectorate. The project was to undertake the issue of what constitutes a validated model in terms of repository performance assessment. The US Nuclear Regulatory Commission (NRC) in 10CFR60.21 requires an explanation of measures used to support the models utilized in the assessment of performance which are included in the License Application. The NRC Nureg 0856, "Final Technical Position on Documentation of Computer Codes for High Level Waste Management" defines the term validation to be, "assurance that a model as embodied in a computer code is a correct representation of the process or system for which it is intended. The notion of validating that a code accurately represents the operational physical processes at a given site has turned out to be a very difficult endeavor. Especially for sites such as Yucca Mountain where the flow regime is poorly known. There is currently no mathematical description of unsaturated flow in fractured – porous media which the majority of the scientific community can support with confidence. Further, all overall performance calculations performed to date by the US DOE assume one dimensional porous flow which enters through the top of Yucca Mountain and makes it way to and through the repository. Not surprisingly these types of calculations lead to the conclusion that little or no release is possible via the groundwater pathway. Quite naturally, the State of Nevada is concerned with these types of calculations, preferring to see something more realistic in terms of conceptual models, fracture pathways, and releases. This concern is carried into the INTRAVAL process because if the DOE is to validate a model of flow at Yucca Mountain within INTRAVAL, the model must be realistic.

290 (ORNL/ER/Sub–87-99053/69) **Site Characterization Plan for decontamination and decommissioning of Buildings 3506 and 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Sep 1993. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002537. Source: OSTI; NTIS; INIS; GPO Dep.

Buildings 3506, the Waste Evaporator Facility, and 3515, the Fission Product Pilot Plant, at Oak Ridge National Laboratory (ORNL), are scheduled for decontamination and decommissioning (D&D). This Site Characterization Plan (SCP) presents the strategy and techniques to be used to characterize Buildings 3506/3515 for the purpose of planning D&D activities. The elements of the site characterization for Buildings 3506/3515 are planning and preparation, field investigation, and characterization reporting. Other level of effort activities will include management and oversight, project controls, meetings, and progress reporting. The objective of the site characterization is to determine the nature and extent of radioactive and hazardous materials and other industrial hazards in and around the buildings. This information will be used in subsequent planning to develop a detailed approach for final decommissioning of the facilities: (1) to evaluate decommissioning alternatives and design the most cost-effective D&D approach; (2) to determine the level and type of protection necessary for D&D workers; and (3) to estimate the types and volumes of wastes generated during D&D activities. The current D&D characterization scope includes the entire building, including the foundation and equipment or materials within the building. To estimate potential worker exposure from the soil during D&D, some subfoundation soil sample collection is planned. Buildings 3506/3515 are located in the ORNL main plant area, to the west and east, respectively, of the South Tank Farm. Building 3506 was built in 1949 to house a liquid waste evaporator and was subsequently used for an incinerator experiment. Partial D&D was done prior to abandonment, and most equipment has been removed. Building 3515 was built in 1948 to house fission product separation equipment. In about 1960, all entrances were sealed with concrete block and mortar. Building 3515 is expected to be highly contaminated.

291 (ORNL/TM–11785) **Evaluation of dry-solids-blend material source for grouts containing 106-AN waste: Final report.** Spence, R.D.; Gilliam, T.M.; Osborne, S.C.; Francis, C.L.; Trotter, D.R. Oak Ridge National Lab., TN (United States). Sep 1993. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93041041. Source: OSTI; NTIS; INIS; GPO Dep.

Stabilization/solidification technology is one of the most widely used techniques for the treatment and ultimate disposal of both radioactive and chemically hazardous wastes. Cement-based products, commonly referred to as grouts, are the predominant materials of choice because of their low associated processing costs, compatibility with a wide variety of disposal scenarios, and ability to meet stringent processing and performance requirements. Such technology is being utilized in a Grout Treatment Facility (GTF) by the Westinghouse Hanford Company (WHC) for the disposal of various wastes, including 106-AN wastes, located on the Hanford Reservation. The WHC personnel have developed a grout formula for 106-AN disposal that is designed to meet stringent performance requirements. This formula consists of a dry-solids blend containing 40 wt % limestone, 28 wt % granulated blast furnace slag (BFS), 28 wt % American Society for Testing and Materials (ASTM) Class F fly ash, and 4 wt % Type I-II-LA Portland cement. This blend is mixed with 106-AN at a mix ratio of 9 lb of dry-solids blend per gallon of waste. This report documents the final results of efforts at Oak Ridge National Laboratory in support of WHC's Grout Technology Program to assess the effects of the source of the dry-solids-blend materials on the resulting grout formula.

292 (ORNL/TM–11824) **Literature review of stabilization/solidification of volatile organic compounds and the implications for Hanford grouts.** Spence, R.D.; Osborne, S.C. Oak Ridge National Lab., TN (United States). Sep 1993. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94000730. Source: OSTI; NTIS; INIS; GPO Dep.

A literature review was conducted on the stabilization/solidification of volatile organic compounds (VOCs). Based on this literature, it is likely that the limestone-containing grout will not permanently immobilize VOCs and that no presently available additives can guarantee permanent immobilization. The Westinghouse hanford company grout may be fairly effective at retarding aqueous leaching of VOCs, and commercial additives can improve this performance. Significant VOC losses do occur during stabilization/solidification, and the high temperatures of the Westinghouse Hanford Company waste and grout should exacerbate this problem. In fact, these high temperatures raise doubts about the presence of VOCs in the double-shell tanks supernates.

293 (ORNL/TM–12063) **The development of a zeolite system for upgrade of the Process Waste Treatment Plant.** Robinson, S.M.; Kent, T.E.; Arnold, W.D.; Parrott, J.R. Jr. Oak Ridge National Lab., TN (United States). Oct 1993. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001117. Source: OSTI; NTIS; GPO Dep.

Studies have been undertaken to design an efficient zeolite ion exchange system for use at the ORNL Process Waste Treatment Plant to remove cesium and strontium to meet discharge limits. This report focuses on two areas: (1) design of column hardware and pretreatment steps needed to eliminate column plugging and channeling and (2) development of equilibrium models for the wastewater system. Results indicate that zeolite columns do not plug as quickly when the wastewater equalization is performed in the new Bethel Valley Storage Tanks instead of the former equalization basin where suspended solids concentration is high. A down-flow column with spent zeolite was used successfully as a prefilter to prevent plugging of the zeolite columns being used to remove strontium and cesium. Equilibrium studies indicate that a Langmuir isotherm models binary zeolite equilibrium data while the modified Dubinin-Polyani model predicts multicomponent data.

294 (PNL–8120) **System design specification for the 1/4-scale tank and ancillary equipment.** Bamberger, J.A. (Pacific Northwest Lab., Richland, WA (United States)); Bates, J.M.; Waters, E.D.; Heimberger, D.T. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001097. Source: OSTI; NTIS; INIS; GPO Dep.

The Fluid Dynamic Test Facility (FDTF) is located in the 336 Building at the 300 Area of the Hanford Site. The FDTF will contain tanks that model the average internal diameter and height of a 3875 m^3 (1-million-gal) double-shell tank at both 1/12- and 1/4-scale, as well as ancillary equipment required to store, mix, and transport waste simulants. Experiments to be conducted in this facility will include investigations of sludge mobilization, slurry uniformity, aerosol generation, sludge washing, and instrumentation development to support start-up of the Hanford Waste Vitrification Project. This facility will also be used to model concepts and mitigating strategies to be used in the resolution of tank safety issues and the retrieval of waste from watch-list tanks.

295 (PNL–8388-Vol.2) **Clean option: An alternative strategy for Hanford Tank Waste Remediation: Volume 2, Detailed description of first example flowsheet.** Swanson, J.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000544. Source: OSTI; NTIS; INIS; GPO Dep.

Disposal of high-level tank wastes at the Hanford Site is currently envisioned to divide the waste between two principal waste forms: glass for the high-level waste (HLW) and grout for the low-level waste (LLW). The draft flow diagram shown in Figure 1.1 was developed as part of the current planning process for the Tank Waste Remediation System (TWRS), which is evaluating options for tank cleanup. The TWRS has been established by the US Department of Energy (DOE) to safely manage the Hanford tank wastes. It includes tank safety and waste disposal issues, as well as the waste pretreatment and waste minimization issues that are involved in the "clean option" discussed in this report. This report describes the results of a study led by Pacific Northwest Laboratory to determine if a more aggressive separations scheme could be devised which could mitigate concerns over the quantity of the HLW and the toxicity of the LLW produced by the reference system. This aggressive scheme, which would meet NRC Class A restrictions (10 CFR 61), would fit within the overall concept depicted in Figure 1.1; it would perform additional and/or modified operations in the areas identified as interim storage, pretreatment, and LLW concentration.

Additional benefits of this scheme might result from using HLW and LLW disposal forms other than glass and grout, but such departures from the reference case are not included at this time. The evaluation of this aggressive separations scheme addressed institutional issues such as: radioactivity remaining in the Hanford Site LLW grout, volume of HLW glass that must be shipped offsite, and disposition of appropriate waste constituents to nonwaste forms.

296 (PNL–8714) **Analysis of volatile headspace gases sampled by cryogenic traps from Westinghouse Hanford Company Tank 242-C-112 March 1992.** Lucke, R.B.; Clauss, S.A. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001551. Source: OSTI; NTIS; INIS; GPO Dep.

Results are given from gas chromatography/mass spectrometry (GC/MS) analyses of the headspace samples obtained by using cryogenic traps from Westinghouse Hanford Company (WHC) Tank 112-C during the month of March, 1992. Samples were analyzed as received with no sample preparation. Analyses included direct GC/MS for volatile/semivolatile components, and direct GC/MS for ammonia. Purge and trap GC/MS analysis was not done. In addition, aliquots were sent to Karl Pool, Pacific Northwest Laboratory, for hydrogen cyanide analysis by ion chromatography, the results are reported here. All concentrations are reported for the methanol extract solutions. To calculate concentrations in the headspace, the cryo-sampling air volume and the methanol rinse volume must be obtained from cryo-sampling personnel at WHC. Triplicate analyses were done on all samples, and average concentrations and standard deviations are reported. One significant result was that no ammonia was detected.

297 (PNL–8741) **Hanford Site Permanent Isolation Surface Barrier Development Program: Fiscal year 1992 and 1993 highlights.** Cadwell, L.L.; Link, S.O.; Gee, G.W. (eds.). Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 56p. Sponsored by USDOE; Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001086. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Permanent Isolation Surface Barrier Development Program was jointly developed by the Pacific Northwest Laboratory and Westinghouse Hanford Company to design and test an earthen cover system that can be used to inhibit water infiltration; plant, animal, and human intrusion; and wind and water erosion. Kaiser Engineers Hanford Company provided engineering design support for the program. Work on barrier design has been under way at Hanford for nearly 10 years. The comprehensive development of a long-term barrier, formerly the Hanford Site Protective Barrier Development Program, was initiated in FY 1986, and a general field-tested design is expected to be completed by FY 1998. Highlights of efforts in FY 1992 and FY 1993 included the resumption of field testing, the completion of the prototype barrier design, and the convening of an external peer review panel, which met twice with the barrier development team. The review panel provided helpful guidance on current and future barrier development activities, while commending the program for its significant technical contributions to innovative barrier technology development.

298 (PNL–8782) **Solid Waste Projection Model: Database (Version 1.4): Technical reference manual.** Blackburn, C.; Cillan, T. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001119. Source: OSTI; NTIS; INIS; GPO Dep.

The Solid Waste Projection Model (SWPM) system is an analytical tool developed by Pacific Northwest Laboratory (PNL) for Westinghouse Hanford Company (WHC). The SWPM system provides a modeling and analysis environment that supports decisions in the process of evaluating various solid waste management alternatives. This document, one of a series describing the SWPM system, contains detailed information regarding the software and data structures utilized in developing the SWPM Version 1.4 Database. This document is intended for use by experienced database specialists and supports database maintenance, utility development, and database enhancement. Those interested in using the SWPM database should refer to the SWPM Database User's Guide. This document is available from the PNL Task M Project Manager (D. L. Stiles, 509-372-4358), the PNL Task L Project Manager (L. L. Armacost, 509-372-4304), the WHC Restoration Projects Section Manager (509-372-1443), or the WHC Waste Characterization Manager (509-372-1193).

299 (PNL–8808) **Organic chemical aging mechanisms: An annotated bibliography: Waste Tank Safety Program.** Samuels, W.D.; Camaioni, D.M.; Nelson, D.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000633. Source: OSTI; NTIS; GPO Dep.

An annotated bibliography has been compiled of the potential chemical and radiological aging mechanisms of the organic constituents (non-ferrocyanide) that would likely be found in the UST at Hanford. The majority of the work that has been conducted on the aging of organic chemicals used for extraction and processing of nuclear materials has been in conjunction with the acid or PUREX type processes. At Hanford the waste being stored in the UST has been stabilized with caustic. The aging factors that were used in this work were radiolysis, hydrolysis and nitrite/nitrate oxidation. The purpose of this work was two-fold: to determine whether or not research had been or is currently being conducted on the species associated with the Hanford UST waste, either as a mixture or as individual chemicals or chemical functionalities, and to determine what areas of chemical aging need to be addressed by further research.

300 (PNL–8818) **The effect of gamma radiation on reference electrodes and platinum and carbon steel bare metal electrodes in a simulated waste solution: Final report.** Danielson, M.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001080. Source: OSTI; NTIS; INIS; GPO Dep.

Electrochemical potential measurements of materials in waste tanks are important in determining if the materials have a propensity for stress corrosion cracking and pitting. Potential measurement requires a reference electrode, but the effect of radiation on the potential generated by the reference electrode has been an unknown quantity. To determine the significance of the radiation effect, Pacific Northwest Laboratory conducted studies of five types of electrodes under gamma radiation at room temperature. The subjects were two types of silver/silver chloride reference electrodes (Fisher and Lazaran), a mercury/calomel reference electrode, a platinum "flag," and a piece of A-537 carbon steel; the electrodes were exposed to a simulated caustic tank environment. The Fisher silver/silver chloride and mercury/calomel reference electrodes showed essentially no radiation effects up to a flux of 2.1E6 R/h and fluence of 9.4E8 R, indicating they would be useful reference electrodes for in-tank studies. The Lazaran® silver/silver chloride electrode showed serious potential deviations at fluences of 2.E8 R, but it would be the electrode of choice in many situations because it is simple to maintain. Radiation affected the open circuit potential of both the platinum and carbon steel electrodes. This effect indicates that corrosion studies without radiation may not duplicate the corrosion processes expected in a waste tank. Mixed-potential theory was used to explain the radiation effects.

301 (PNL–8839) **Evaluation of methods to measure surface level in waste storage tanks: Second test sequence.** Peters, T.J.; Park, W.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000587. Source: OSTI; NTIS; GPO Dep.

This report describes the results of a program conducted at the Pacific Northwest Laboratory (PNL) and Westinghouse Hanford Company (WHC) to identify alternative methods to measure the surface level in the waste tanks. This program examined commercially available devices for measuring the distance to a target. This is a continuation of a program started in FY93. In the first test sequence, tests were performed.on five devices to determine their applicability to measure the surface level in the waste tanks. The devices were the Enraf-Nonius™ Model 872 Radar Gauge, the Enraf-Nonius™ Model 854 Advanced Technology Gauge (ATG), the

Stanley Tool Laser Measuring Device, the Robertshaw Inven-Tel® Precision Level Gauge, and the Micro Switch Model 942 Acoustic Sensor. In addition, discussions were held with several manufacturer representatives regarding other potential devices. The results of these tests were documented in a previous report. Two additional devices were tested in this test sequence. The devices were the Krohne Model BM-70 level radar gauge and the L&J Technologies Model MCG-1500XL Servo Gauge. In addition, a 4–20 ma output board was installed in the ATG and the current output was monitored to determine the accuracy of the gauge through this board. Also, tests were conducted with a redesigned displacer for the ATG. The displacer was designed to minimize the possibility of (1) getting caught in the riser and (2) obtaining crystal growth on the surface.

302 (PNL–8847) **Initial evaluation of Sandia National Laboratory-prepared crystalline silico-titanates for cesium recovery.** Bray, L.A.; Carson, K.J.; Elovich, R.J. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94002382. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory initiated a study of a new class of inorganic ion exchange materials that selectively extracts cesium (Cs), strontium (Sr), and plutonium (Pu) from alkaline radioactive waste solutions. These materials, identified as crystalline silico-titanates (CST), were developed by scientists at the Sandia National Laboratory (SNL) and Texas A&M. This report summarizes preliminary results for the measurement of batch distribution coefficient (K_d) values for the powdered CST materials compared to previously tested ion exchange materials: IONSIV IE-96 (a zeolite produced by UOP), CS-100 (an organic resin produced by Rohm and Haas), and BIB-DJ (a new resorcinol-formaldehyde organic resin produced by Boulder Scientific). Excellent results were obtained for CST inorganic exchangers that could be significant in the development of processes for the near-term pretreatment of Hanford alkaline wastes. The following observations and conclusions resulted from this study: (1) Several CST samples prepared at SNL had a higher capacity to remove Cs from solution as compared to BIB-DJ, IE-96, and CS-100. (2) Cesium distribution results showed that CST samples TAM-40, -42, -43, -70, and -74 had λ values of ~2,200 (λ = Cs $K_d \times \rho_b$; where λ represents the number of exchanger bed volumes of feed that can be loaded on an ion exchange column) at a pH value >14. (3) Cesium distribution values for CST exchangers doubled as the aqueous temperature decreased from 40° to 10°C. (4) Crystalline silico-titanates have the capacity to remove Cs as well as Sr and Pu from alkaline wastes unless organic complexants are present. Experimental results indicated that complexed Sr was not removed, and Pu is not expected to be removed.

303 (PNL–8855) **Computer modeling of ORNL storage tank sludge mobilization and mixing.** Terrones, G.; Eyler, L.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001120. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents and analyzes the results of the computer modeling of mixing and mobilization of sludge in horizontal, cylindrical storage tanks using submerged liquid jets. The computer modeling uses the TEMPEST computational fluid dynamics computer program. The horizontal, cylindrical storage tank configuration is similar to the Melton Valley Storage Tanks (MVST) at Oak Ridge National (ORNL). The MVST tank contents exhibit non-homogeneous, non-Newtonian rheology characteristics. The eventual goals of the simulations are to determine under what conditions sludge mobilization using submerged liquid jets is feasible in tanks of this configuration, and to estimate mixing times required to approach homogeneity of the contents of the tanks.

304 (PNL–8863) **A literature review of methods of analysis of organic analytes in radioactive wastes with an emphasis on sources from the United Kingdom.** Clauss, S.A.; Bean, R.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000904. Source: OSTI; NTIS; INIS; GPO Dep.

This report, compiled by Pacific Northwest Laboratory (PNL), examines literature originating through the United Kingdom (UK) nuclear industry relating to the analyses of organic constituents of radioactive waste. Additionally, secondary references from the UK and other counties, including the United States, have been reviewed. The purpose of this literature review was to find analytical methods that would apply to the mixed-waste matrices found at Hanford.

305 (PNL–8875) **Aerosol and vapor characterization of tank 241-C-103: Flammability assessment sampling system, and method validation.** Ligotke, M.W. (Pacific Northwest Lab., Richland, WA (United States)); Clauss, T.R.; Dennis, G.W.; Lucke, R.B.; Goheen, S.C.; Huckaby, J.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94002381. Source: OSTI; NTIS; GPO Dep.

The purpose of the work was to support a flammability assessment and characterization of materials present in the vapor space of the Hanford waste tank designated 241-C-103. The single-shell tank contains floating organic layers on top of an aqueous supernate and, reportedly, a dense fog of unknown composition. An in-tank sampling method for aerosol concentrations of nominal paraffin hydrocarbons (NPH) was developed and validated. A sampling system was designed and assembled. Procedures and preparations for in-tank sampling were completed. The work was performed by Pacific Northwest Laboratory (PNL) as part of a waste tank vapor characterization project for Westinghouse Hanford Company (WHC). The need to sample NPH aerosols was established in a preliminary assessment in which the flammability of materials in the vapor space were related to NPH concentration. In the assessment, a total fuel load of 46 mg/L was estimated to be the lower flammability level (LFL). Aerosol chamber tests were performed that simulated tank vapor space conditions, and method validation data were obtained using sorbent traps designed to collect droplet- and vapor-phase aerosols. A range of aerosol characteristics and sampling conditions were tested. Test variables included sample flow rate, duration, relative humidity, aqueous fog, aerosol mass concentration, and sample mass loading in the sorbent traps. Analytical methods were developed to quantify NPH in the sorbent traps. Samples were analyzed for NPH mass and distribution of five analytes using a gas chromatograph/mass spectrometer (GC/MS) and compared to gravimetric results.

306 (PNL–8876) **Computational analysis of fluid flow and zonal deposition in ferrocyanide single-shell tanks: Ferrocyanide Safety Program.** McGrail, B.P.; Trent, D.S.; Terrones, G.; Hudson, J.D.; Michener, T.E. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001552. Source: OSTI; NTIS; INIS; GPO Dep.

Safety of single-shell tanks containing ferrocyanide wastes is of concern. Ferrocyanide in the presence of an oxidizer such as $NaNO_3$ or $NaNO_2$ is explosively combustible when concentrated and heated. Evaluating the processes that could affect the fuel content of waste and distribution of the tank heat load is important. Highly alkaline liquid wastes were transferred in and out of the tanks over several years. Since $Na_2NiFe(CN)_6$ is much more soluble in alkaline media, the ferrocyanide could be dispersed from the tank more easily. If $Cs_2NiFe(CN)_6$ or $CsNaNiFe(CN)_6$ are also soluble in alkaline media, solubilization and transport of ^{137}Cs could also occur. Transporting this heat generating radionuclide to a localized area in the tanks is a potential mechanism for generating a "hot spot." Fluid convection could potentially speed the transport process considerably over aqueous diffusion alone. A stability analysis was performed for a dense fluid layer overlying a porous medium saturated by a less dense fluid with the finding that the configuration is unconditionally unstable and independent of the properties of the porous medium or the magnitude of the fluid density difference. A parametric modeling study of the buoyancy-driven flow due to a thermal gradient was combusted to establish the relationship between the waste physical and thermal properties and natural convection heat transfer. The effects of diffusion and fluid

convection on the redistribution of the ^{137}Cs were evaluated with a 2-D coupled heat and mass transport model. The maximum predicted temperature rise associated with the formation of zones was only 5°C and thus is of no concern in terms of generating a localized "hot spot."

307 (PNL–8886) **Evaluation of bubbler/diaphragm techniques to measure surface level in the waste storage tanks.** Peters, T.J.; Hickman, B.J.; Colson, J.B. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94002182. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of tests conducted at the Pacific Northwest Laboratory (PNL) to determine if a bubbler technique can be used to determine the surface level in the waste tanks. Two techniques were evaluated. The first technique is a standard bubbler system in which a tube is placed below the surface of the liquid to be measured and air pressure inside a tube is increased until bubbles begin to become emitted from the tube. The air pressure then is a function of the pressure at the bottom of the tube. The second technique involves a system similar to the standard bubbler technique, but instead of bubbles being released into the material to be gauged, air pressure is increased against a diaphragm until enough pressure is applied to overcome the pressure of the liquid at the given depth, at which time the air then flows in a return loop back to a vent. The advantage of the diaphragm system is that it is a sealed system; thus no air is released into the waste tank materials, and it is not possible for the waste tank materials to get into the air flow. Based on the results of the tests conducted in this program, it appears that the bubbler and diaphragm systems that were tested could not be used for accurate measurements of the level in the waste tanks. Both exhibited deposits of simulated waste tank material at the end of the devices which affected the ability of the gauge to accurately determine changes in the surface level even though the measured value of the level was inaccurate. Further investigations into the cause of this inaccuracy may be warranted. Alternate diaphragm materials may improve the performance of this gauge.

308 (PNL–8908) **340 Facility compliance assessment.** English, S.L. (Pacific Northwest Lab., Richland, WA (United States)). Pacific Northwest Lab., Richland, WA (United States); Engineering-Science, Inc., Atlanta, GA (United States). Oct 1993. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001550. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides an environmental compliance evaluation of the RLWS and the RPS systems of the 340 Facility. The emphasis of the evaluation centers on compliance with WAC requirements for hazardous and mixed waste facilities, federal regulations, and Westinghouse Hanford Company (WHC) requirements pertinent to the operation of the 340 Facility. The 340 Facility is not covered under either an interim status Part A permit or a RCRA Part B permit. The detailed discussion of compliance deficiencies are summarized in Section 2.0. This includes items of significance that require action to ensure facility compliance with WAC, federal regulations, and WHC requirements. Outstanding issues exist for radioactive airborne effluent sampling and monitoring, radioactive liquid effluent sampling and monitoring, non-radioactive liquid effluent sampling and monitoring, less than 90 day waste storage tanks, and requirements for a permitted facility.

309 (PNL-SA–22596) **Preliminary estimates of cost savings for defense high level waste vitrification options.** Merrill, R.A.; Chapman, C.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-930906–13: '93 international conference on nuclear waste management and environmental remediation, Prague (Czech Republic), 5-11 Sep 1993). Order Number DE94001670. Source: OSTI; NTIS; INIS; GPO Dep.

The potential for realizing cost savings in the disposal of defense high-level waste through process and design modificatins has been considered. Proposed modifications range from simple changes in the canister design to development of an advanced melter capable of processing glass with a higher waste loading. Preliminary calculations estimate the total disposal cost (not including capital or operating costs) for defense high-level waste to be about $7.9 billion dollars for the reference conditions described in this paper, while projected savings resulting from the proposed process and design changes could reduce the disposal cost of defense high-level waste by up to $5.2 billion.

310 (PNL-SA–22748) **Estimating emissions from grout pouring operations.** Ballinger, M.Y.; Hendrickson, D.W. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308137–7: 1993 summer national American Institute of Chemical Engineers (AIChE) conference, Seattle, WA (United States), 15-18 Aug 1993). Order Number DE94001672. Source: OSTI; NTIS; INIS; GPO Dep.

Grouting is a method for disposal of low-level radioactive waste in which a contaminated solution is mixed into a slurry, poured into a large storage vault, then dried, fixing the contaminants within a stable solid matrix. A model (RELEASE) has been developed to estimate the quantity of aeorsol created during the pouring process. Information and equations derived from spill experiments were used in the model to determine release fractions. This paper discusses the derivation of the release fraction equation used in the code and the model used to account for gravity settling of particles in the vault. The input and results for a base case application are shown.

311 (RFP–4767) **Technology Development saltcrete evaluation.** Connell, J.M.; Faucette, A.M.; Jorgensen, S.C.; Oldham, J.H.; Swan-Bogard, K.M. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. 16 Aug 1993. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94000996. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the project was to identify, define, and resolve the issues pertaining to the production of a certifiable cemented salt waste form ("saltcrete") using the existing cementation equipment in the Building 374 liquid waste treatment facility. This reportdescribes the saltcrete process, issues precluding waste form certification, issues resolution where appropriate, and formulation optimization results. This report summarizes acceptance criteria, waste characterization, problem assessment, and formulation study results for the period October 1, 1992, to June 30, 1993.

312 (RFP–4779) **Equipment evaluation for low density polyethylene encapsulated nitrate salt waste at the Rocky Flats Plant.** Yamada, W.I.; Faucette, A.M.; Jantzen, R.C.; Logsdon, B.W.; Oldham, J.H.; Saiki, D.M.; Yudnich, R.J. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. 30 Aug 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94001769. Source: OSTI; NTIS; INIS; GPO Dep.

Mixed wastes at the Rocky Flats Plant (RFP) are subject to regulation by the Resource Conservation and Recovery Act (RCRA). Polymer solidification is being developed as a final treatment technology for several of these mixed wastes, including nitrate salts. Encapsulation nitrate salts with low density polyethylene (LDPE) has been the preliminary focus of the RFP polymer solidification effort. Literature reviews, industry surveys, and lab-scale and pilot-scale tests have been conducted to evaluate several options for encapsulating nitrate salts with LDPE. Most of the effort has focused on identifying compatible drying and extrusion technologies. Other processing options, specifically meltration and non-heated compounding machines, were also investigated. The best approach appears to be pretreatment of the nitrate salt waste brine in either a vertical or horizontal thin film evaporator followed by compounding of the dried waste with LDPE in an intermeshing, co-rotating, twin-screw extruder. Additional pilot-scale tests planned for the fall of 1993 should further support this recommendation. Preliminary evaluation work indicates that meltration is not possible at atmospheric pressure with the LDPE (Chevron PE-1409) provided by RFP. However, meltration should be possible at atmospheric pressure using another LDPE formulation with altered physical and rheological properties: Lower molecular weight and lower viscosity (Epoline C-15). Contract modifications are now in process to allow a follow-on pilot scale demonstration. Questions regarding changed safety

and physical properties of the resultant LDPE waste form due to use of the Epoline C-15 will be addressed. No additional work with non-heated mixer compounder machines is planned at this time.

313 (SAND–90-1984) **Programmer's manual for CAMCON: Compliance Assessment Methodology CONtroller.** Rechard, R.P. (Sandia National Labs., Albuquerque, NM (United States)); Gilkey, A.P.; Rudeen, D.K.; Byle, K.A.; Iuzzolino, H.J. Sandia National Labs., Albuquerque, NM (United States). May 1993. 675p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE93019777. Source: OSTI; NTIS; INIS; GPO Dep.

CAMCON, the Compliance Assessment Methodology CONtroller, is an analysis system that assists in assessing the compliance of the Waste Isolation Pilot Plant (WIPP) with applicable long-term regulations of the US Environmental Protection Agency, including Subpart B of the Environmental Standards for the Management and Disposal of spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 40 CFR 191 and 40CFR268.6, which is the portion of the Land Disposal Restrictions implementing the Resource, Conservative, and Recovery Act of 1976, as amended that states the conditions for disposal of hazardous chemical wastes. This manual provides an architectural overview of the CAMCON system. Furthermore this manual presents guidelines and presents suggestions for programmers developing the many different types of software necessary to investigate various events and physical processes of the WIPP. These guidelines include user interface requirements, minimum quality assurance requirements, coding style suggestions, and the use of numerous software libraries developed specifically for or adapted for the CAMCON system.

314 (SAND–92-0427) **A summary of the models used for the mechanical response of disposal rooms in the Waste Isolation Pilot Plant with regard to compliance with 40 CFR 191, Subpart B.** Butcher, B.M.; Mendenhall, F.T. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000548. Source: OSTI; NTIS; INIS; GPO Dep.

A summary is presented of the results of a number of studies conducted prior to March 1992 that have led to a conceptual model describing how the porosity (and therefore the permeability) of waste and backfill in a Waste Isolation Pilot Plant disposal room changes with time and also describes how results from calculations involving mathematical models of these processes are used to provide input into performance assessment of the repository. Included in the report are descriptions of essential material response or constitutive models that include the influence of gas generation and the response of simple gas-pressurized cracks and fractures in salt, marker beds, and clay seams. Two-dimensional versus three-dimensional disposal room configurations and descriptions of the differences between numerical codes are also discussed. Calculational results using the mathematical models for disposal room response are described, beginning with closure of empty rooms and becoming progressively more complex. More recent results address some of the effects of gas generation in a room containing waste and backfill and intersected by a gas permeable marker bed. Developments currently in progress to improve the evaluation of the disposal room performance are addressing the coupling between brine flow and closure and the two-dimensional capability for analyzing a complete panel of rooms. Next, a method is described for including disposal room closure results into performance assessment analyses that determine if the repository is in compliance with regulatory standards. The coupling is accomplished using closure surfaces that describe the relationship among porosity, total amount of gas in the repository, and time. A number of conclusions about room response and recommendations for further work are included throughout the report.

315 (SAND–92-0700/4) **Preliminary performance assessment for the Waste Isolation Pilot Plant, December 1992: Volume 4: Uncertainty and sensitivity analyses for 40 CFR 191, Subpart B.** Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 436p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001933. Source: OSTI; NTIS; INIS; GPO Dep.

Before disposing of transuranic radioactive waste in the Waste Isolation Pilot Plant (WIPP), the United States Department of Energy (DOE) must evaluate compliance with applicable long-term regulations of the United States Environmental Protection Agency (EPA). Sandia National Laboratories is conducting iterative performance assessments (PAs) of the WIPP for the DOE to provide interim guidance while preparing for a final compliance evaluation. This volume of the 1992 PA contains results of uncertainty and sensitivity analyses with respect to the EPA's Environmental Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191, Subpart B). Additional information about the 1992 PA is provided in other volumes. Results of the 1992 uncertainty and sensitivity analyses indicate that, conditional on the modeling assumptions, the choice of parameters selected for sampling, and the assigned parameter-value distributions, the most important parameters for which uncertainty has the potential to affect compliance with 40 CFR 191B are: drilling intensity, intrusion borehole permeability, halite and anhydrite permeabilities, radionuclide solubilities and distribution coefficients, fracture spacing in the Culebra Dolomite Member of the Rustler Formation, porosity of the Culebra, and spatial variability of Culebra transmissivity. Performance with respect to 40 CFR 191B is insensitive to uncertainty in other parameters; however, additional data are needed to confirm that reality lies within the assigned distributions.

316 (SAND–92-0700/5) **Preliminary performance assessment for the Waste Isolation Pilot Plant, December 1992: Volume 5, Uncertainty and sensitivity analyses of gas and brine migration for undisturbed performance.** Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 270p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001778. Source: OSTI; NTIS; INIS; GPO Dep.

Before disposing of transuranic radioactive waste in the Waste Isolation Pilot Plant (WIPP), the United States Department of Energy (DOE) must evaluate compliance with applicable long-term regulations of the United States Environmental Protection Agency (EPA). Sandia National Laboratories is conducting iterative performance assessments (PAs) of the WIPP for the DOE to provide interim guidance while preparing for a final compliance evaluation. This volume of the 1992 PA contains results of uncertainty and sensitivity analyses with respect to migration of gas and brine from the undisturbed repository. Additional information about the 1992 PA is provided in other volumes. Volume 1 contains an overview of WIPP PA and results of a preliminary comparison with 40 CFR 191, Subpart B. Volume 2 describes the technical basis for the performance assessment, including descriptions of the linked computational models used in the Monte Carlo analyses. Volume 3 contains the reference data base and values for input parameters used in consequence and probability modeling. Volume 4 contains uncertainty and sensitivity analyses with respect to the EPA's Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191, Subpart B). Finally, guidance derived from the entire 1992 PA is presented in Volume 6. Results of the 1992 uncertainty and sensitivity analyses indicate that, conditional on the modeling assumptions and the assigned parameter-value distributions, the most important parameters for which uncertainty has the potential to affect gas and brine migration from the undisturbed repository are: initial liquid saturation in the waste, anhydrite permeability, biodegradation-reaction stoichiometry, gas-generation rates for both corrosion and biodegradation under inundated conditions, and the permeability of the long-term shaft seal.

317 (SAND–92-2013) **Uncertainty and sensitivity analyses for gas and brine migration at the Waste Isolation Pilot Plant, May 1992.** Helton, J.C. (Arizona State Univ., Tempe, AZ (United States)); Bean, J.E.; Butcher, B.M.; Garner, J.W.; Vaughn, P.; Schreiber, J.D.; Swift, P.N. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001701. Source: OSTI; NTIS; INIS; GPO Dep.

Uncertainty and sensitivity analysis techniques based on Latin hypercube sampling, partial correlation analysis, stepwise regression analysis and examination of scatterplots are used in conjunction with the BRAGFLO model to examine two phase flow (i.e., gas and brine) at the Waste Isolation Pilot Plant (WIPP), which is being developed by the US Department of Energy as a disposal facility for transuranic waste. The analyses consider either a single waste panel or the entire repository in conjunction with the following cases: (1) fully consolidated shaft, (2) system of shaft seals with panel seals, and (3) single shaft seal without panel seals. The purpose of this analysis is to develop insights on factors that are potentially important in showing compliance with applicable regulations of the US Environmental Protection Agency (i.e., 40 CFR 191, Subpart B; 40 CFR 268). The primary topics investigated are (1) gas production due to corrosion of steel, (2) gas production due to microbial degradation of cellulosics, (3) gas migration into anhydrite marker beds in the Salado Formation, (4) gas migration through a system of shaft seals to overlying strata, and (5) gas migration through a single shaft seal to overlying strata. Important variables identified in the analyses include initial brine saturation of the waste, stoichiometric terms for corrosion of steel and microbial degradation of cellulosics, gas barrier pressure in the anhydrite marker beds, shaft seal permeability, and panel seal permeability.

318 (SAND–92-7277) **A select bibliography with abstracts of reports related to Waste Isolation Pilot Plant geotechnical studies (1972–1990).** Powers, D.W. (Powers (Dennis W.), Anthony, TX (United States)); Martin, M.L. Sandia National Labs., Albuquerque, NM (United States); Powers (Dennis W.), Anthony, TX (United States); International Technology, Inc., Las Vegas, NV (United States). Aug 1993. 501p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001559. Source: OSTI; NTIS; INIS; GPO Dep.

This select bibliography contains 941 entries. Each bibliographic entry contains the citation of a report, conference paper, or journal article containing geotechnical information about the Waste Isolation Pilot Plant (WIPP). The entries cover the period from 1972, when investigation began for a WIPP Site in southeastern New Mexico, through December 1990. Each entry is followed by an abstract. If an abstract or suitable summary existed, it has been included; 316 abstracts were written for other documents. For some entries, an annotation has been provided to clarify the abstract, comment on the setting and significance of the document, or guide the reader to related reports. An index of key words/phrases is included for all entries.

319 (SAND–93-1109C) **An approach to validation of thermomechanical models.** Costin, L.S. (Sandia National Labs., Albuquerque, NM (United States)); Hardy, M.P.; Brechtel, C.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309228–1: Focus 93: site characterization and model validation, Las Vegas, NV (United States), 26-29 Sep 1993). Order Number DE93018826. Source: OSTI; NTIS; GPO Dep.

Thermomechanical models are being developed to support the design of an Exploratory Studies Facility (ESF) and a potential high-level nuclear waste repository at Yucca Mountain, Nevada. These models are used for preclosure design of underground openings, such as access drifts, emplacement drifts, and waste emplacement boreholes; and in support of postclosure issue resolution relating to waste canister performance, disturbance of the hydrological properties of the host rock, and overall system performance assessment. For both design and performance assessment, the purpose of using models in analyses is to better understand and quantify some phenomenon or process. Therefore, validation is an important process that must be pursued in conjunction with the development and application of models. The Site Characterization Plan (SCP) addressed some general aspects of model validation, but no specific approach has, as yet, been developed for either design or performance assessment models. This paper will discuss a proposed process for thermomechanical model validation and will focus on the use of laboratory and in situ experiments as part of the validation process. The process may be generic enough in nature that it could be applied to the validation of other types of models, for example, models of unsaturated hydrologic flow.

320 (SAND–93-1197) **Conceptual plan: Two-Phase Flow Laboratory Program for the Waste Isolation Pilot Plant.** Howarth, S.M. Sandia National Labs., Albuquerque, NM (United States). Jul 1993. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000550. Source: OSTI; NTIS; INIS; GPO Dep.

The Salado Two-Phase Flow Laboratory Program was established to address concerns regarding two-phase flow properties and to provide WIPP-specific, geologically consistent experimental data to develop more appropriate correlations for Salado rock to replace those currently used in Performance Assessment models. Researchers in Sandia's Fluid Flow and Transport Department originally identified and emphasized the need for laboratory measurements of Salado threshold pressure and relative permeability. The program expanded to include the measurement of capillary pressure, rock compressibility, porosity, and intrinsic permeability and the assessment of core damage. Sensitivity analyses identified the anhydrite interbed layers as the most likely path for the dissipation of waste-generated gas from waste-storage rooms because of their relatively high permeability. Due to this the program will initially focus on the anhydrite interbed material. The program may expand to include similar rock and flow measurements on other WIPP materials including impure halite, pure halite, and backfill and seal materials. This conceptual plan presents the scope, objectives, and historical documentation of the development of the Salado Two-Phase Flow Program through January 1993. Potential laboratory techniques for assessing core damage and measuring porosity, rock compressibility, capillary and threshold pressure, permeability as a function of stress, and relative permeability are discussed. Details of actual test designs, test procedures, and data analysis are not included in this report, but will be included in the Salado Two-Phase Flow Laboratory Program Test Plan pending the results of experimental and other scoping activities in FY93.

321 (SAND–93-2250C) **Evaluation of soil characterization technologies using a stochastic, value-of-information approach.** Kaplan, P.G. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931095–32: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001823. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has initiated an integrated demonstration program to develop and compare new technologies for the characterization of uranium-contaminated soils. As part of this effort, a performance-assessment task was funded in February, 1993 to evaluate the field tested technologies. Performance assessment can be cleaned as the analysis that evaluates a system's, or technology's, ability to meet the criteria specified for performance. Four new technologies were field tested at the Fernald Environmental Management Restoration Co. in Ohio. In the next section, the goals of this performance assessment task are discussed. The following section discusses issues that must be resolved if the goals are to be successfully met. The author concludes with a discussion of the potential benefits to performance assessment of the approach taken. This paper is intended to be the first of a series of documentation that describes the work. Also in this proceedings is a paper on the field demonstration at the Fernald site and a description of the technologies (Tidwell et al, 1993) and a paper on the application of advanced geostatistical techniques (Rautman, 1993). The overall approach is to simply demonstrate the applicability of concepts that are well described in the literature but are not routinely applied to problems in environmental remediation, restoration, and waste management. The basic geostatistical concepts are documented in Clark (1979) and in Issaks and Srivastava (1989). Advanced concepts and applications, along with software, are discussed in Deutsch and Journel (1992). Integration of geostatistical modeling with a decision-analytic framework is discussed in Freeze et al (1992). Information-theoretic and probabilistic concepts are borrowed from the work of Shannon (1948), Jaynes (1957), and Harr (1987). The author sees the task as one

of introducing and applying robust methodologies with demonstrated applicability in other fields to the problem at hand.

322 (SAND–93-2266C) **Incorporating long-term climate change in performance assessment for the Waste Isolation Pilot Plant.** Swift, P.N. (Sandia National Labs., Albuquerque, NM (United States)); Baker, B.L.; Economy, K.; Garner, J.W.; Helton, J.C.; Rudeen, D.K. Sandia National Labs., Albuquerque, NM (United States). 18 Sep 1993. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ;AC04-76DP00789. (CONF-9310135–1: 32. Hanford symposium on health and the environment, Richland, WA (United States), 18-21 Oct 1993). Order Number DE94002286. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) is developing the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico for the disposal of transuranic wastes generated by defense programs. Applicable regulations (40 CFR 191) require the DOE to evaluate disposal-system performance for 10,000 yr. Climatic changes may affect performance by altering groundwater flow. Paleoclimatic data from southeastern New Mexico and the surrounding area indicate that the wettest and coolest Quaternary climate at the site can be represented by that at the last glacial maximum, when mean annual precipitation was approximately twice that of the present. The hottest and driest climates have been similar to that of the present. The regularity of global glacial cycles during the late Pleistocene confirms that the climate of the last glacial maximum is suitable for use as a cooler and wetter bound for variability during the next 10,000 yr. Climate variability is incorporated into groundwater-flow modeling for WIPP PA by causing hydraulic head in a portion of the model-domain boundary to rise to the ground surface with hypothetical increases in precipitation during the next 10,000 yr. Variability in modeled disposal-system performance introduced by allowing head values to vary over this range is insignificant compared to variability resulting from other causes, including incomplete understanding of transport processes. Preliminary performance assessments suggest that climate variability will not affect regulatory compliance.

323 (SKB-TR–92-36) **On the interpretation of double-packer tests in heterogeneous porous media: Numerical simulations using the stochastic continuum analogue.** Follin, S. (Lund Univ. (Sweden). Dept. of Engineering Geology). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 66p. Order Number DE94606153. Source: OSTI; NTIS; INIS.

Flow in fractured crystalline (hard) rocks is of interest in Sweden for assessing the postclosure radiological safety of a deep repository for high-level nuclear waste. For simulation of flow and mass transport in the far field different porous media concepts are often used, whereas discrete fracture/channel network concepts are often used for near-field simulations. Due to lack of data, it is generally necessary to have resort to single-hole double-packer test data for the far-field simulations, i.e., test data on a small scale are regularized in order to fit a comparatively coarser numerical discretization, which is governed by various computational constraints. In the present study the Monte Carlo method is used to investigate the relationship between the transmissivity value interpreted and the corresponding radius of influence in conjunction with single-hole double-packer tests in heterogeneous formations. The numerical flow domain is treated as a two-dimensional heterogeneous porous medium with a spatially varying diffusivity on 3 m scale. The Monte Carlo simulations demonstrate the sensitivity to the correlation range of a spatially varying diffusivity field. In contradiction to what is tacitly assumed in stochastic subsurface hydrology, the results show that the lateral support scale (e.g., the radius of influence) of transmissivity measurements in heterogeneous porous media is a random variable, which is affected by both the hydraulic and statistical characteristics. If these results are general, the traditional methods for scaling-up, assuming a constant lateral scale of support and a multi normal distribution, may lead to an underestimation of the persistence and connectivity of transmissive zones, particularly in highly heterogeneous porous media.

324 (SKB-TR–92-38) **Climatic changes and uplift patterns - past, present and future.** Bjoerck, S. (Lund Univ. (Sweden). Dept. of Quaternary Geology); Svensson, N.O. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Nov 1992. 84p. Order Number DE94606154. Source: OSTI; NTIS; INIS.

Our knowledge about the Pleistocene (= last 2.5 million years) climatic changes and their global environmental effects on the Earth system, e.g. the glacial-interglacial cycles, the sea level changes, and the significant crustal movements in glaciated regions, has increased greatly during the last decades. This report outlines the historical background and the present state-of-the-arts on these matters. Because the driving mechanisms and feed-back effects behind these changes have been more and more discussed in earth-science literature, analysed, and probably also better and better understood, it has become possible to present theoretical models for future climates (not including mans influence on the earth system). The report presents and discusses one such climate model (short of predicting mans future behaviour and its consequent effect on climate) and its likely implications on future climatic and glacial conditions, and bedrock movements, with focus on the Stockholm region. Possibilities for quaternary geologists to establish and map post glacial fault zones, related to irregular bedrock movements, are also briefly outlined in the report. (222 refs.).

325 (SKB-TR–92-40) **PASS - Project on Alternative Systems Study. Performance assessment of bentonite clay barrier in three repository concepts: VDH, KBS-3 and VLH.** Pusch, R. (Clay Technology AB, Lund (Sweden)); Boergesson, L. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 192p. Order Number DE94606155. Source: OSTI; NTIS; INIS.

The three repository concepts VDH, KBS3 and VLH have been investigated with respect to their functions in short- and long-term perspectives. The study shows that while KBS3 does not require development of new techniques for excavation and application of buffers and canisters, such development is needed for VLH and VDH. The various physical processes in the deployment part of VDH are more critical and less understood than those in KBS3 and VLH, but the sealing effect of the plugged 'low-temperature' part is sufficiently good to make the concept qualify as a candidate. VLH has the highest and KBS3 the lowest temperature and the latter has the highest potential for good long-term function. (59 refs.).

326 (SKB-TR–92-42) **Project on Alternative Systems Study - PASS. Comparison of technology of KBS-3, MLH, VLH and VDH concepts by using an expert group.** Olsson, Lars (Geostatistik Lars Olsson AB (Sweden)); Sandstedt, H. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Sep 1992. 88p. Order Number DE94606156. Source: OSTI; NTIS; INIS.

This report constitutes a technical comparison and ranking of four repository concepts for final disposal of spent nuclear fuel, that have been studied by SKB: KBS-3, Medium Long Holes (MLH), Very Long Holes (VLH) and Very Deep Holes (VDH). The technical comparison is part of the project 'Project on Alternative Systems Study, PASS', which was initiated by SKB. With the objective of presenting a ranking of the four concepts. Besides this comparison of Technology the ranking is separately made for Long-term Performance and Safety, and Costs before the merging into one verdict. The ranking regarding Technology was carried out in accordance with the method Analytical Hierarchy Process, AHP, and by the aid of expert judgement in the form of a group consisting of six experts. The AHP method implies that the criteria for comparison are ordered in a hierarchy and that the ranking is carried out by pairwise comparison of the criteria. In the evaluation process a measure of the relative importance of each criterion is obtained. The result of the expert judgement exercise was that each expert individually ranked the four concepts in the following order with the top ranked alternative first: KBS-3, MLH, VLH and VDH. The common opinion among the experts was that the top ranking of KBS-3 is significant and the the major criteria used in the study could change substantially without changing the top ranking of KBS-3.

327 (SKB-TR–92-43) **Project Alternative Systems Study - PASS. Analysis of performance and long-term safety of repository concepts.** Birgersson, L. (Kemakta Konsult AB, Stockholm (Sweden)); Skagius, K.; Wiborgh, M.; Widen, H. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Sep 1992. 131p. Order Number DE94606157. Source: OSTI; NTIS; INIS.

This study is part of the Project on Alternative Systems Study, PASS, with the overall aim to perform a technical/economical ranking of alternative repository concepts and canisters for the final storage of spent nuclear fuel. The comparison should in the first stage separately assess technology in construction and operation, long-term performance and safety, and costs. Three of the repository concepts are assumed to be located at a depth of approximately 500 m in the host rock, KBS-3, Very Long Holes (VLH) and Medium Long Holes (MLH). In the KBS-3 concept the canisters are deposited in vertical deposition holes in a system of parallel storage tunnels. In the VLH concept larger canisters are deposited in long horizontal tunnels. The MLH concept, is an evolution of the two other concepts, with KBS-3 type canisters deposited in horizontal tunnels. Smaller canisters are to be deposited in deep bore holes at a depth between 2000 to 4000 m in the Very Deep Holes (VDH) concept. In all concepts the canisters will be surrounded by a bentonite buffer. The aim of the present study is to analyze and compare the performance and long-term safety of the repository concepts. Only a qualitative comparison of the concepts is made as no calculations of radionuclide releases or dose to man have been performed. The ranking of the repository concepts was carried out by comparing the VDH, VLH and MLH concept with the KBS-3 concept. The performance and long-term safety of the repositories located at 500 m level will be based on a multiple barrier system and the predictions for the concepts will involve similar uncertainties. (54 refs.).

328 (SKB-TR–93-01) **Stress redistribution and void growth in butt-welded canisters for spent nuclear fuel.** Josefson, B.L. (Chalmers Univ. of Technology, Gothenburg (Sweden). Div. of Solid Mechanics); Karlsson, L.; Haeggblad, H.Aa. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Feb 1993. 20p. Order Number DE94606158. Source: OSTI; NTIS; INIS.

The stress-redistribution in Cu-Fe canisters for spent nuclear fuel during waiting for deposition and after final deposition is calculated numerically. The constitutive equation modelling creep deformation during this time period employs values on materials parameters determined within the SKB-project on 'mechanical integrity of canisters for spent nuclear fuel'. The welding residual stresses are redistributed without lowering maximum values during the waiting period, a very low amount of void growth is predicted for this type of copper during the deposition period. This leads to an estimated very large rupture time.

329 (SKB-TR–93-02) **Hydrothermal field test with french candidate clay embedding steel heater in the Stripa mine.** Pusch, R. (Clay Technology AB, Lund (Sweden)); Karnland, O.; Lajudie, A.; Lechelle, J.; Bouchet, A. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 92p. Order Number DE94606159. Source: OSTI; NTIS; INIS.

Field experiments with French kaolinite/smectite clay heated up to 170 degrees C in boreholes in granite were conducted for 8 months and 4 years. The clay heated for 8 months has a considerably higher water content and it had undergone much less changes in mineralogy and physical properties than the clay exposed to heating for 4 years. The drying of the latter clay was probably caused by hydrogen gas from corrosion of the heater. The clay next to the heater turned into clay-stone despite conversion of the kaolinite component to smectite. (42 refs).

330 (SKB-TR–93-03) **MX 80 clay exposed to high temperatures and gamma radiation.** Pusch, R. (Clay Technology AB, Lund (Sweden)); Karnland, O.; Lajudie, A.; Decarreau, A. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 53p. Order Number DE94606160. Source: OSTI; NTIS; INIS.

MX-80 bentonite saturated with pressurized weakly brackish water, was heated up to 130 degrees C with and without γ-radiation for 1 years. The smectite content remained largely intact while accessory minerals like feldspars were strongly affected. The hydraulic conductivity was not altered but slight cementation by precipitated silica took place.

331 (SKB-TR–93-04) **Project on Alternative Systems Study - PASS. Final report.** Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Oct 1992. 122p. Order Number DE94606161. Source: OSTI; NTIS; INIS.

Alternative repository systems for deep disposal of spent fuel and different types of canisters are studied regarding technical aspects in Project on Alternative System Study (PASS). The objective is to present a ranking of repository systems as well as of canister types for each system. The studies and compared systems are: KBS-3, Medium Long Tunnels (MLH), Long tunnels (VLH) and Deep Boreholes (VDH). For KBS-3 and MLH five canister types are compared (copper/steel, copper/lead, copper (HIP), steel/lead and steel), for VLH two types (copper/steel and steel), and for VDH three types (titanium/concrete with non-consolidated fuel assemblies, titanium/concrete with consolidated assemblies and copper (HIP) with non-consolidated assemblies). The comparison is separated into three sub-comparisons (Technology, Long-term performance and safety, and Costs), which eventually are merged into one ranking. With respect to canister alternatives the result is that the copper/steel canister is ranked first for KBS-3, MLH and VLH, while the titanium/concrete canister is ranked first for VDH (non-consolidated as well as consolidated assemblies). With these canister alternatives the merged ranking of repository systems results in placing KBS-3 slightly in front of MLH. VLH comes thereafter and VDH last. (32 refs.).

332 (SKB-TR–93-06) **Mineralogy, geochemistry and petrophysics of red coloured granite adjacent to fractures.** Eliasson, T. (Chalmers University of Technology and Univ. of Gothenburg (Sweden). Dept. of Geology). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Mar 1993. 84p. Order Number DE94606162. Source: OSTI; NTIS; INIS.

Mineralogical, geochemical and petrophysical investigations were conducted of red-coloured alteration rims and of the neighbouring unaltered equivalents along fractures within granite from Aespoe. An investigation was made also of a weak to rather strong, red-coloured granite from the Stripa mine, as well as a weak brownish-red colouration, definitely no hydrothermal in origin, of weathered rinds at a glacial polished rock surface in the Bohus granite. When approaching the fracture planes in the Aespoe granite, the most diagnostic alteration features are * the saussuritisation and Fe-oxyhydroxide staining of plagioclase, * the crystallisation chlorite pseudomorphs after biotite and * the hematisation of magnetite. The porosity within the alteration zones increases generally 2 to 3 times compared with the protolith rock, whereas the densities decrease by some 5 to 10%. The oxidation of magnetite gives as much as a tenfold lowering of the magnetic susceptibility. The red colouration of the Stripa granite is caused by hematite $\pm$ Fe-oxyhydroxide formation along microfractures, grain boundaries and, subordinately, the main minerals. Oxidation and re-precipitation of iron liberated during a retrograde muscovitisation of principally chlorite is interpreted to be the cause of the formation of the ferric oxides. The rather homogeneous density and porosity values of the grey and of the red-coloured granites reflect the minor change in the mineralogy when going from fresh into altered granite. Weathering and whitening of plagioclase in the bleached, outer zone and precipitation of small quantities of Fe-oxyhydroxides/hydroxides in the brownish-red zone cause the macroscopic colouration of the weathering rind below the glacial polished rock surface of Bohus granite. There is a marked increase in porosity from the interior fresh (c. 0.4-0.5%) towards the exterior bleached zone (c.1.5-2%) of the subaerialy, weathered Bohus granite surface. (Abstract Truncated).

333 (SKI-TR–93-18) **Extended probabilistic system assessment calculations within the SKI project-90.** Pereira, A. (Stockholm Univ. (Sweden). Dept. of Physics). Swedish Nuclear Power Inspectorate, Stockholm (Sweden). Mar 1993. 46p. Order Number DE94606163. Source: OSTI; NTIS; INIS.

The probabilistic system assessment calculation reported in the SKI Project-90 final documents were restricted to the following nuclides: ^{14}C, ^{129}I, ^{135}Cs, ^{237}Np and ^{240}Pu. In this report we have extended those calculations to another five nuclides: ^{79}Se, ^{243}Am, ^{240}Pu, ^{93}Zr and ^{99}Tc. The execution of probabilistic assessment calculations integrated in the context of SKIs first safety analysis exercise of an hypothetic final repository for high-level nuclear waste in Sweden, was a learning experience of relevance for the

conduction of probabilistic safety assessment in future exercises. Some major conclusions and viewpoints of future need related with probabilistic assessment were withdrawn from this work and are presented in our report.

334 (SKI-TR–93-25) **Initial two dimensional groundwater flow calculations for SITE-94.** Boghammar, A. (Kemakta Konsult AB, Stockholm (Sweden)); Grundfelt, B. Swedish Nuclear Power Inspectorate, Stockholm (Sweden). May 1993. 23p. Order Number DE94606164. Source: OSTI; NTIS; INIS.

This report concerns a study which is part of the SKI performance assessment project SITE-94. SITE-94 is a performance assessment of a hypothetical repository at a real site. The main objective of the project is to determine how site specific data should be assimilated into the performance assessment process and to evaluate how uncertainties inherent in site characterization will influence performance assessment results. Other important elements of SITE-94 are the development of a practical and defensible methodology for defining, constructing and analyzing scenarios, the development of approaches for treatment of uncertainties, evaluation of canister integrity, and the development and application of an appropriate Quality Assurance plan for Performance Assessments.

335 (SR/H–623) **[Comments on scope of work for additional waste storage tanks and pumping pit].** Taber, B.L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 27 Jul 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000606. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides comments on the scope of work for additional waste storage tanks and pumping pit (PWO 6010H).

336 (SR/H–637) **Project 8980: Savannah River Plant 242-F – External waste evaporation facilities WR 50020 viscosity of concentrated wastes.** Meyer, C.A. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 30 Jan 1956. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001026. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the viscosity of a composite of the Savannah River Plant low activity coating waste.

337 (SR/H–644) **PID – SRP – solid radioactive waste incineration – W.R. 860575: Report on visit to Rocky Flats and Los Alamos.** Monroe, E.S. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 16 Dec 1977. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001985. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A visit was made on December 7 to the Rocky Flats Plant of Rockwell International and on December 8 to the Los Alamos Scientific Laboratory. The purpose of the visit was to inspect and discuss incinerators for radioactive solid wastes. B. D. Helton and H. E. Hooton of SRP, R. A. Clark of Wilmington AED, H. S. Campbell, E. M. Clapp, B. H. Kirk, J. Scafaria, and C. D. Spencer of Design were members of the visiting party. Both plants were quite open in allowing inspection of their equipment and in the discussions.

338 (SR/H–645) **EWR 860575 – AFCT – Design integration study: Visit Rocky Flats and LASL sites for design data on incinerators of solid radioactive waste.** Spencer, C.D. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 20 Dec 1977. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001986. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report summarizes the findings of tours of the Rocky Flats Plant and the Los Alamos Scientific Laboratory. The objective of these tours was to gather engineering and background information on incinerators for radioactive waste combustion. Rocky Flats contains a rotary kiln, an agitated hearth, and a fluidized bed incinerator, in various stages of construction. LASL contains a controlled-air incinerator. The tour emphasized the design, operation, and maintenance of these facilities.

339 (TAC–13) **Thirteenth annual report of the Technical Advisory Committee on the Nuclear Fuel Waste Management Program.** Atomic Energy of Canada Ltd., Pinawa, MB (Canada). Whiteshell Nuclear Research Establishment. May 1993. 66p. Sponsored by Atomic Energy of Canada Ltd., Ottawa, ON (Canada). Source: OSTI; Dr. L. W. Schemilt, General Sciences Building, Room 216, McMaster University, Hamilton, Ontario L8S 4K1.

Available in French as TAC-13F.

This report details activities since the last reporting period by the Technical Advisory Committee (TAC). The emphasis of the work in the Canadian Nuclear Fuel Waste Management Program (CNFWMP) has been on the writing of the Environmental Impact Statement (EIS) and the associated set of the primary reference document as well as supporting documents. These are in preparation for submission to the Environmental Assessment Review Panel who will lead the national evaluation of the disposal concept under the auspices of the Federal Environmental Assessment Review Office (FEARO).

340 (UCRL-ID–111979) **Post-closure performance assessment of waste packages for the Yucca Mountain Project.** O'Connell, W.J.; Ueng, T.S.; Lewis, L.C. Lawrence Livermore National Lab., CA (United States). Oct 1993. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93041100. Source: OSTI; NTIS; INIS; GPO Dep.

This report details a system model of some core features of the performance of waste packages for the permanent disposal of spent nuclear fuel at the Yucca Mountain Site. The model is realized in the prototype computer program PANDORA-1.1. The PANDORA system model links processes leading to possible release of radionuclides from the waste package. The PANDORA submodels are being developed for processes and conditions specific to this potential repository site, notably the comparatively dry location in an arid area and well above the groundwater table, and the rock medium of porous partially welded tuff.

341 (UCRL-ID–112432) **Technical basis and programmatic requirements for laboratory study of hydrological properties of the near-field environment.** Lin, W. Lawrence Livermore National Lab., CA (United States). Oct 1993. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001854. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the technical basis and programmatic requirements for a study plant governs laboratory study of hydrological properties of the near-field environment of a nuclear waste repository. The Study Plan (SP), known as "Near-Field Environment Hydrological Properties (NFEHP)," will be reviewed by Yucca Mountain Site Characterization Project Office (YMPO) of the United States Department of Energy (DOE). The final version of the SP may be different from this document. The SP is identified by Work Breakdown Structure (WBS) as WBS 1.2.2.2.2. This study is described in Section 8.3.4.2.4.1 of the Site Characterization Plant (SCP). The purpose and objective of the Near-Field Environment Hydrological Properties study are to understand, at the laboratory scale, hydrological processes expected to occur within the near field of nuclear waste repository after waste package emplacement.

342 (UCRL-ID–112834) **Technical basis and programmatic requirements for large block testing of coupled thermal-mechanical-hydrological-chemical processes.** Lin, Wunan. Lawrence Livermore National Lab., CA (United States). Sep 1993. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93040441. Source: OSTI; INIS; NTIS; GPO Dep.

This document contains the technical basis and programmatic requirements for a scientific investigation plan that governs tests on a large block of tuff for understanding the coupled thermal-mechanical-hydrological-chemical processes. This study is part of the field testing described in Section 8.3.4.2.4.1 of the Site Characterization Plan (SCP) for the Yucca Mountain Project. The first, and most important objective is to understand the coupled TMHC processes in order to develop models that will predict the performance of a nuclear waste repository. The block and fracture

properties (including hydrology and geochemistry) can be well characterized from at least five exposed surfaces, and the block can be dismantled for post-test examinations. The second objective is to provide preliminary data for development of models that will predict the quality and quantity of water in the near-field environment of a repository over the current 10,000 year regulatory period of radioactive decay. The third objective is to develop and evaluate the various measurement systems and techniques that will later be employed in the Engineered Barrier System Field Tests (EBSFT).

343 (UCRL-ID–114774) **Experimental studies and thermodynamic modelling of volatilities of uranium, plutonium, and americium from their oxides and from their oxides interacted with ash.** Krikorian, O.H.; Ebbinghaus, B.B.; Adamson, M.G.; Fontes, A.S. Jr.; Fleming, D.L. Lawrence Livermore National Lab., CA (United States). 15 Sep 1993. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001859. Source: OSTI; NTIS; GPO Dep.

The purpose of this study is to identify the types and amounts of volatile gaseous species of U, Pu, and Am that are produced in the combustion chamber offgases of mixed waste oxidation processors. Primary emphasis is on the Rocky Flats Plant Fluidized Bed Incinerator. Transpiration experiments have been carried out on U_3O_8(s), U_3O_8 interacted with various ash materials, PuO_2(s), PuO_2 interacted with ash materials, and a 3%PuO_2/0.06%AmO_2/ash material, all in the presence of steam and oxygen, and at temperatures in the vicinity of 1,300 K. UO_3(g) and $UO_2(OH)_2$(g) have been identified as the uranium volatile species and thermodynamic data established for them. Pu and Am are found to have very low volatilities, and carryover of Pu and Am as fine dust particulates is found to dominate over vapor transport. The authors are able to set upper limits on Pu and Am volatilities. Very little lowering of U volatility is found for U_3O_8 interacted with typical ashes. However, ashes high in Na_2O (6.4 wt %) or in CaO (25 wt %) showed about an order of magnitude reduction in U volatility. Thermodynamic modeling studies were carried out that show that for aluminosilicate ash materials, it is the presence of group I and group II oxides that reduces the activity of the actinide oxides. K_2O is the most effective followed by Na_2O and CaO for common ash constituents. A more major effect in actinide activity lowering could be achieved by adding excess group I or group II oxides to exceed their interaction with the ash and lead to direct formation of alkali or alkaline earth uranates, plutonates, and americates.

344 (UCRL-JC–113748) **Human Factors Standards and implementation plan for waste management programs.** Banks, W.W. Lawrence Livermore National Lab., CA (United States). Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930408–83: International high-level radioactive waste management conference, Las Vegas, NV (United States), 25-29 Apr 1993). Order Number DE93019152. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) is dedicated to assuring safety and public confidence by conducting a thorough assessment and upgrade of its nuclear policies and procedures. To ensure that DOE field operations protect the health and safety of employees, the general public and the environment, new operational procedures, standards, and implementation plans are both required and forthcoming from DOE Headquarters, NE-74. Part of this effort requires the establishment and integration of human factors engineering design standards and implementation methods to reduce the probability of human error, human injury and radiological exposure. Human Factors professionals work to assure that technology is designed and utilized safely and efficiently to serve the needs and capabilities of the people who must use this technology. The primary goal of human factors engineering is to ensure compatibility and congruence between the people, equipment, tasks, procedures and training so as to minimize human error and assure that "total systems performance and reliability" are achieved.

345 (WHC-EP–0182-63) **Tank farm surveillance and waste status summary report for June 1993.** Hanlon, B.M. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002426. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the official inventory for radioactive waste stored in underground tanks in the 200 Areas at the Hanford Site. Data that depict the status of stored radioactive waste and tank vessel integrity are contained within the report. This report provides data on each of the existing 177 large underground waste storage tanks and 49 smaller catch tanks and special surveillance facilities, and supplemental information regarding tank surveillance anomalies and ongoing investigations. This report is intended to meet the requirement of US Department of Energy-Richland Operations Office Order 5820.2A, Chapter I, Section 3.e. (3) (DOE-RL, 1990, Radioactive Waste Management, US Department of Energy-Richland Operation Office, Richland, Washington) requiring the reporting of waste inventories and space utilization for Hanford Tank Farm Tanks.

346 (WHC-EP–0393-Rev.3-Pt.1) **Hanford Waste Vitrification Plant Quality Assurance Program description: Overview and applications: Revision 3, Part 1.** Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001236. Source: OSTI; NTIS; INIS; GPO Dep.

This document (Parts 1 and 2) describes the requirements that must be implemented during the design and construction phases for the Hanford Waste Vitrification Plant Project Quality Assurance Program. This program is being implemented to ensure the acceptability of high-level radioactive canistered waste forms produced by the Hanford Waste Vitrification Plant for disposal in a licensed federal repository.

347 (WHC-EP–0393-Rev.3-Pt.2) **Hanford Waste Vitrification Plant Quality Assurance Program description for high-level waste form development and qualification: Revision 3, Part 2.** Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001237. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Waste Vitrification Plant Project has been established to convert the high-level radioactive waste associated with nuclear defense production at the Hanford Site into a waste form suitable for disposal in a deep geologic repository. The Hanford Waste Vitrification Plant will mix processed radioactive waste with borosilicate material, then heat the mixture to its melting point (vitrification) to forin a glass-like substance that traps the radionuclides in the glass matrix upon cooling. The Hanford Waste Vitrification Plant Quality Assurance Program has been established to support the mission of the Hanford Waste Vitrification Plant. This Quality Assurance Program Description has been written to document the Hanford Waste Vitrification Plant Quality Assurance Program.

348 (WHC-EP–0643-Rev.1) **Tank characterization report for single-shell tank 241-U-110: Revision 1.** Brown, T.M.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002354. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-U-110 (U-110) is a Hanford Site waste tank that was ;most recently sampled in November and December 1989. Analysis of the samples obtained from tank U-110 was conducted to support the characterization of the contents of this tank and to support Hanford Federal Facility Agreement and Consent Order milestone M-10-00 (Ecology, et al. 1992). Because of incomplete recovery of the waste during sampling, there may be bias in the results of this characterization report.

349 (WHC-MR–0433) **Type C investigation report of crane two-blocking event at 241-SY-101 double-shell waste tank.** Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002413. Source: OSTI; NTIS; GPO Dep.

This report summarizes the results of a joint Westinghouse Hanford Company (WHC) and Kaiser Engineers Hanford (KEH) investigation into the June 22, 1993 crane event in SY tank farm. The direct cause of the two-block event was operator error; the operator's concentration was distracted from the area of primary

responsibility, which was crane operation. Poor work planning and equipment design were contributing factors in the event. Lack of an adequate supply of rope to use as a tag line added increased complexity to the task. This complexity, in the absence of operator aids or designed interlocks to prevent two-blocking the crane, contributed to the event. The timeliness of event reporting issue appears to center on the completeness of event reporting to the line organization responsible for the facility. The causes of this were inadequate training of the designated person-in-charge (PIC) and no formal requirement for external contractors to notify the facility owner of the event.

350 (WHC-SA–1799) **The development of permanent isolation surface barriers: Hanford Site, Richland, Washington, U.S.A.** Wing, N.R. (Westinghouse Hanford Co., Richland, WA (United States)); Gee, G.W. Westinghouse Hanford Co., Richland, WA (United States). Jan 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9306137–1: Geo confine 93: international symposium on geology and confinement of toxic wastes, Montpellier (France), 8-11 Jun 1993). Order Number DE93040408. Source: OSTI; NTIS; INIS; GPO Dep.

Permanent isolation surface barriers are being developed to isolate wastes disposed of in situ (in place) at the US Department of Energy's Hanford Site in Washington State (USA). The current focus of development efforts is to design barriers that will function in a semiarid to subhumid climate, Emit infiltration and percolation of water through the waste zone to near-zero amounts, be maintenance free, and last up to 1000 years or more. A series of field tests, experiments, and lysimeter studies have been conducted for several years. The results of tests to date confirm that the Hanford barrier concepts are valid for both present and wetter climatic conditions. The data collected also have provided the foundation for the design of a large prototype barrier to be constructed later in 1993. This paper presents the results of some of the field tests, experiments, and lysimeter studies.

351 (WHC-SA–1811) **Cleanout and stabilization at B Plant.** Gehrke, J.W.; Davis, W.E. Westinghouse Hanford Co., Richland, WA (United States). Jul 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9308137–5: 1993 summer national American Institute of Chemical Engineers (AIChE) conference, Seattle, WA (United States), 15-18 Aug 1993). Order Number DE93040313. Source: OSTI; NTIS; INIS; GPO Dep.

B Plant is a 48-year-old canyon facility operated by the US Department of Energy at the Hanford Site in Washington State. Its last process mission was completed in 1985. The new mission is to complete a transition to long-term surveillance and maintenance before decontamination and decommissioning. This paper is a status report on the new mission, with emphasis on key technical and programmatic decisions to be made regarding radioactive hazards, or source terms, in the plant. The B Plant structure is a design uniquely suited for radioactive chemical processing and remote maintenance. The structure provides heavy concrete shielding, separating clean working areas from highly contaminated process areas. To complicate the transition to shutdown for the B Plant facility, several operating systems must and will remain operational to support the adjacent Waste Encapsulation and Storage Facility and its radioactive strontium and cesium capsule inventory. This paper details progress made and tasks remaining for cleaning up B Plant. The tasks include decontamination of the canyon work area, removal of radioactive liquids stored from previous process missions, deactivation of equipment, and characterizing/stabilizing source terms ranging from contaminated High-Efficiency Particulate Air filters to residual concrete and equipment contamination. Progress that has been made during the first year, since this new mission was defined (mid 1992 to mid 1993), is documented in this paper. The cleanup mission for B Plant is expected to be of special interest to other US Department of Energy canyon facilities.

352 (WHC-SA–1881) **Structural analysis of Hanford's single-shell 241-C-106 tank: A first step toward waste-tank remediation.** Harris, J.P. (Westinghouse Hanford Co., Richland, WA (United States)); Julyk, L.J.; Marlow, R.S.; Moore, C.J.; Day, J.P.; Dyrness, A.D.; Jagadish, P.; Shulman, J.S. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102–12: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93040405. Source: OSTI; NTIS; INIS; GPO Dep.

The buried single-shell waste tank 241-C-106, located at the US Department of Energy's Hanford Site, has been a repository for various liquid radioactive waste materials since its construction in 1943. A first step toward waste tank remediation is demonstrating that remediation activities can be performed safely. Determination of the current structural capacity of this high-heat tank is an important element in this assessment. A structural finite-element model of tank 241-C-106 has been developed to assess the tank's structural integrity with respect to in situ conditions and additional remediation surface loads. To predict structural integrity realistically, the model appropriately addresses two complex issues: (1) surrounding soil-tank interaction associated with thermal expansion cycling and surcharge load distribution and (2) concrete-property degradation and creep resulting from exposure to high temperatures generated by the waste. This paper describes the development of the 241-C-106 structural model, analysis methodology, and tank-specific structural acceptance criteria.

353 (WHC-SA–1935) **Environmental restoration waste materials co-disposal.** Phillips, S.J. (Westinghouse Hanford Co., Richland, WA (United States)); Alexander, R.G.; England, J.L.; Kirdendall, J.R.; Raney, E.A.; Stewart, W.E.; Dagan, E.B.; Holt, R.G. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–17: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001194. Source: OSTI; NTIS; INIS; GPO Dep.

Co-disposal of radioactive and hazardous waste is a highly efficient and cost-saving technology. The technology used for final treatment of soil-washing size fractionization operations is being demonstrated on simulated waste. Treated material (wasterock) is used to stabilize and isolate retired underground waste disposal structures or is used to construct landfills or equivalent surface or subsurface structures. Prototype equipment is under development as well as undergoing standardized testing protocols to prequalify treated waste materials. Polymer and hydraulic cement solidification agents are currently used for geotechnical demonstration activities.

354 (WHC-SA–1975) **Neptunium storage at Hanford.** Alderman, C.J.; Shiraga, S.S.; Schwartz, R.A.; Smith, R.J.; Wootan, D.W. Westinghouse Hanford Co., Richland, WA (United States). Jun 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940101–2: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE93019121. Source: OSTI; NTIS; INIS; GPO Dep.

A decision must be made regarding whether the United State's stockpile of neptunium should be discarded into the waste stream or kept for the production of Pu-238. Although the cost of long term storage is not inconsequential, to dispose of the material means the closing of our option to maintain control over our Pu-238 stockpile. Within the Fuels and Materials Examination Facility at Hanford there exists a remotely operated facility that can be converted for neptunium storage. This paper describes the facility and the anticipated handling requirements.

355 (WHC-SA–2025) **Interaction analysis method for the Hanford Waste Vitrification Plant.** Grant, P.R. (Fluor Daniel, Inc., Irvine, CA (United States)); Deshotels, R.L.; Van Katwijk, C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102–26: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94001173. Source: OSTI; NTIS; GPO Dep.

In order to anticipate potential problems as early as possible during the design effort, a method for interaction analysis was developed to meet the specific hazards of the Hanford Waste Vitrification Plant (HWVP). The requirement for interaction analysis is

given in DOE Order 6430.1B and DOE-STD-1021-92. The purpose of the interaction analysis is to ensure that non-safety class items will not fail in a manner that will adversely affect the ability of any safety class item to perform its safety function. In the HWVP there are few structures, equipment, or controls that are safety class. In addition to damage due to failure of non-safety class items as a result of natural phenomena, threats to HWVP safety class items include the following: room flooding from firewater, leakage of chemically reactive liquids, high-pressure gas impingement from leaking piping, rocket-type impact from broken pressurized gas cylinders, loss of control of mobile equipment, cryogenic liquid spill, fire, and smoke. The time needed to perform the interaction analysis is minimized by consolidating safety class items into segregated areas. Each area containing safety class items is evaluated, and any potential threat to the safety functions is noted. After relocation of safety class items is considered, items that pose a threat are generally upgraded to eliminate the threat to the safety class items. Upgrading is the preferred option when relocation is not possible. An example will illustrate the method and application in the phased design, procurement, and construction environment of the HWVP.

356 (WHC-SA–2026) **Elevated temperature effects on concrete properties.** Grant, P.R. (Fluor Daniel, Inc., Irvine, CA (United States)); Gruber, R.S.; Van Katwijk, C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001180. Source: OSTI; NTIS; INIS; GPO Dep.

The design of facilities to process or store radioactive wastes presents many challenging engineering problems. Such facilities must not only provide for safe storage of radioactive wastes but they must also be able to maintain confinement of these materials during and after natural phenomena events. Heat generated by the radioactive decay of the wastes will cause the temperature of the concrete containment structure to increase to a magnitude higher than that found in conventional structures. These elevated temperatures will cause strength-related concrete properties to degrade over time. For concrete temperatures less than 150°F, no reduction in strength is taken and the provisions of ACI 349, which states that higher temperatures are allowed if tests are provided to evaluate the reduction in concrete strength properties, apply. Methods proposed in a Pacific Northwest Laboratory (PNL) report, Modeling of Time-Variant Concrete Properties at Elevated Temperatures, can be used to evaluate the effects of elevated temperatures on concrete properties. Using these modified concrete properties the capacity of a concrete structure, subjected to elevated temperatures, to resist natural phenomena hazards can be determined.

357 (WHC-SA–2055) **Application of spectral gamma-ray borehole geophysics for characterization of radionuclide contamination at Hanford.** Brodeur, J.R.; Koizumi, C.J.; Meisner, J.P.; Price, R.K.; Fassett, J.W. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–28: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001691. Source: OSTI; NTIS; INIS; GPO Dep.

An innovative, passive, gamma-ray borehole logging program was developed at Hanford for the purpose of identifying and quantifying the gamma-ray-emitting radioisotopes in the subsurface. Recent nuclear counting equipment was configured into a borehole logging system and calibration methods were devised for the in situ assay of man-made radionuclides. Operation procedures and data analysis methods were developed, creating an efficient production logging system. The logging program has proven to be effective when used in a screening mode for characterizing effluent release sites at Hanford. It located the primary gamma-emitting contaminants and identified which of the sites had contributed to the groundwater contamination. At one of the single-shell tank farms, the system was used to quantify the unsaturated zone contamination and trace the contamination back to the tank leak sources. It also provided a baseline of the radioelement concentrations for future data comparisons and to permit identification of a dynamic radionuclide transport system. In this manner, the logging program can help to identify future tank leaks. When combined with an inexpensive drilling method, the logging program can produce in situ radioelement concentration data at a fraction of the cost of conventional drilling and sampling, without personnel exposure to the contamination or generation of waste, and it can be done in a matter of days instead of months. Future developments will refine the quality assurance program so that the system will produce laboratory-quality in situ assays. Future applications will require a high degree of quality assurance.

358 (WHC-SA–2062) **Accelerated cleanup of mixed waste units on the Hanford Site, Richland, Washington.** Patterson, J.K.; Johnson, W.L.; Downey, H.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–23: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001686. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a status of the expedited response action (ERA) projects currently being implemented at the Hanford Site. A detailed review of the accomplishments to date, the technologies employed, the problems encountered, and an analysis of the lessons learned are included. A total of nine ERAs have been initiated at the Hanford Site and are presented in a case study format with emphasis on the progress being made and the challenges ahead.

359 (WHC-SA–2078) **Characterization of wastes in and around early reactors at the Hanford Site: The use of historical research.** Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–8: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94000736. Source: OSTI; NTIS; INIS; GPO Dep.

This paper will present the waste characterization knowledge that has been gained in the first, "Large-Scale Remediation Study" to be performed on the reactor areas (100 Areas) of the Hanford Site. Undertaken throughout the past year, this research project has identified thousands of pieces of buried hardware, as well as the volumes of liquid wastes in burial sites in the reactor areas. The author of this landmark study, Dr. Michele Gerber, will discuss historical research as a safe and cost-effective characterization tool.

360 (WHC-SA–2108) **Trends in actinide processing at Hanford.** Harmon, H.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002319. Source: OSTI; NTIS; INIS; GPO Dep.

In 1989, the mission at the Hanford Site began a dramatic and sometimes painful transition. The days of production–as we used to know it–are over. Our mission officially has become waste management and environmental cleanup. This mission change didn't eliminate many jobs–in fact, budgets have grown dramatically to support the new mission. Most all of the same skilled crafts, engineers, and scientists are still required for the new mission. This change has not eliminated the need for actinide processing, but it has certainly changed the focus that our actinide chemists and process engineers have. The focus used to be on such things as increasing capacity, improving separations efficiency, and product purity. Minimizing waste had become a more important theme in recent years and it is still a very important concept in the waste management and environmental cleanup arena. However, at Hanford, a new set of words dominates the actinide process scene as we work to deal with actinides that still reside in a variety of forms at the Hanford Site. These words are repackage, stabilize, remove, store and dispose. Some key activities in each of these areas are described in this report.

361 (WHC-SD-EN-TI–195) **Geophysical survey of 105-DR Pluto Crib, 116-DR-4, 100-D Area.** Bergstrom, K.A. Westinghouse Hanford Co., Richland, WA (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001685. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this Geophysical Survey was to verify the location of the 105-DR Pluto Crib, 116-DR-4. A surface monument currently marks its location. The crib is 10 feet by 10 feet and 15 feet deep. Ground-Penetrating Radar was the geophysical method selected to conduct the investigation.

362 (WHC-SD-HWV-TRP–006) **PUREX style jumper connector type III gasket test report.** Wagner, R.N. (ed.); Austin, D.A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041341. Source: OSTI; NTIS; GPO Dep.

This report summarizes data obtained from testing of type III Teflon gaskets used on PUREX-type process jumper connectors. The purpose of these tests was to asses the performance characteristics of the type III gaskets, currently planned to be used in the Hanford Waste Vitrification Plant (HWVP). Results indicate that the Teflon gaskets deform severally under heat and applied moment loads. The gaskets also lose their ability to hold pressure when thermally cycled, and cannot hold elevated pressures unless they are retorqued between cycles. Gasket failure ultimately occurs after one or more cycles.

363 (WHC-SD-W026-TRP–006) **Entry/Exit Port testing, test report.** Winkelman, R.H. Westinghouse Hanford Co., Richland, WA (United States). May 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001007. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Receiving and Processing Module I (WRAP-1) facility must have the ability to allow 55-gallon drums to enter and exit glovebox enclosures. An Entry/Exit Port (Appendix 1, Figure 1), designed by United Engineers and Constructors (UE&C), is one method chosen for drum transfer. The Entry/Exit Port is to be used for entry of 55-gallon drums into both process entry gloveboxes, exit of 55-gallon drum waste pucks from the low-level waste (LLW) glovebox, and loadout of waste from the restricted waste management glovebox. The Entry/Exit Port relies on capture velocity air flow and a neoprene seal to provide alpha confinement when the Port is in the open and closed positions, respectively. Since the glovebox is in a slight vacuum, air flow is directed into the glovebox through the space between the overpack drum and glovebox floor. The air flow is to direct any airborne contamination into the glovebox. A neoprene seal is used to seal the Port door to the glovebox floor, thus maintaining confinement in the closed position. Entry/Exit Port testing took place February 17, 1993, through April 14, 1993, in the 305 building of Westinghouse Hanford Company. Testing was performed in accordance with the Entry/Exit Port Testing Test Plan, document number WHC-SD-WO26-TP-005. A prototype Entry/Exit Port built at the Hanford Site was tested using fluorescent paint pigment and smoke candles as simulant contaminants. This test report is an interim test report. Further developmental testing is required to test modifications made to the Port as the original design of the Port did not provide complete confinement during all stages of operation.

364 (WINCO–1130) **Calcination of Fluorinel-sodium waste blends using sugar as a feed additive (formerly WINCO-11879).** Newby, B.J.; Thomson, T.D.; O'Brien, B.H. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1992. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000720. Source: OSTI; NTIS; INIS; GPO Dep.

Methods were studied for using sugar as a feed additive for converting the sodium-bearing wastes stored at the Idaho Chemical Processing Plant into granular, free flowing solids by fluidized-bed calcination at 500°C. All methods studied blended sodium-bearing wastes with Fluorinel wastes but differed in the types of sugar (sucrose or dextrose) that were added to the blend. The most promising sugar additive was determined to be sucrose, since it is converted more completely to inorganic carbon than is dextrose. The effect of the feed aluminum-to-alkali metal mole ratio on calcination of these blends with sugar was also investigated. Increasing the aluminum-to-alkali metal ratio from 0.6 to 1.0 decreased the calcine product-to-fines ratio from 3.0 to 1.0 and the attrition index from 80 to 15%. Further increasing the ratio to 1.25 had no effect.

365 (WINCO–1132) **Listed waste determination report: Environmental characterization.** Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1993. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000718. Source: OSTI; NTIS; INIS; GPO Dep.

On September 23, 1988, the US Environmental Protection Agency (EPA) published a notice clarifying interim status requirements for the management of radioactive mixed waste thereby subjecting the Idaho National Engineering Laboratory (INEL) and other applicable Department of Energy (DOE) sites to regulation under the Resource Conservation and Recovery Act (RCRA). Therefore, the DOE was required to submit a Part A Permit application for each treatment, storage, and disposal (TSD) unit within the INEL, defining the waste codes and processes to be regulated under RCRA. The September 1990 revised Part A Permit application, that was approved by the State of Idaho identified 101 potential acute and toxic hazardous waste codes (F-, P-, and U-listed wastes according to 40 CFR 261.31 and 40 CFR 261.33) for some TSD units at the Idaho Chemical Processing Plant. Most of these waste were assumed to have been introduced into the High-level Liquid Waste TSD units via laboratory drains connected to the Process Equipment Waste (PEW) evaporator (PEW system). At that time, a detailed and systematic evaluation of hazardous chemical use and disposal practices had not been conducted to determine if F-, P-, or Unlisted waste had been disposed to the PEW system. The purpose of this investigation was to perform a systematic and detailed evaluation of the use and disposal of the 101 F-, P-, and Unlisted chemicals found in the approved September 1990 Part A Permit application. This investigation was aimed at determining which listed wastes, as defined in 40 CFR 261.31 (F-listed) and 261.33 (P & Unlisted) were discharged to the PEW system. Results of this investigation will be used to support revisions to the RCRA Part A Permit application.

366 (WINCO–1133) **Effect of aluminum and silicon reactants and process parameters on glass-ceramic waste form characteristics for immobilization of high-level fluorinel-sodium calcined waste.** Vinjamuri, K. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1993. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000717. Source: OSTI; NTIS; INIS; GPO Dep.

In this report, the effects of aluminum and silicon reactants, process soak time and the initial calcine particle size on glass-ceramic waste form characteristics for immobilization of the high-level fluorinel-sodium calcined waste stored at the Idaho Chemical Processing Plant (ICPP) are investigated. The waste form characteristics include density, total and normalized elemental leach rates, and microstructure. Glass-ceramic waste forms were prepared by hot isostatically pressing (HIPing) a pre-compacted mixture of pilot plant fluorinel-sodium calcine, Al, and Si metal powders at 1050°C, 20,000 psi for 4 hours. One of the formulations with 2 wt % Al was HIPed for 4, 8, 16 and 24 hours at the same temperature and pressure. The calcine particle size range include as calcined particle size smaller than 600 μm (finer than −30 mesh, or 215 μm Mass Median Diameter, MMD) and 180 μm (finer than 80 mesh, or 49 μm MMD).

367 (WINCO–1136) **^{137}Cs and ^{131}I tracer studies on Zr/Na and Al/Na pilot plant calcine to evaluate thermal processes as calcine pretreatment options.** Tranter, T.J.; Brewer, K.N. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jul 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000713. Source: OSTI; NTIS; INIS; GPO Dep.

The reason for performing volatility studies on pilot plant calcine is to determine the cesium, and iodine decontamination factors as a function of time, temperature, and calcine type. This report discusses separations processes which are being evaluated for ICPP calcine to reduce the high-level waste volume requiring disposal in a geological repository. Reducing the high-level waste volume may reduce disposal cost and conserve repository space. Several aqueous separation processes may be applicable in partitioning the

high-level constituents (actinides and fission products). These processes require calcine dissolution in acid prior to actinide and fission product separation. Cesium may be a difficult element to separate from the dissolved calcine because of the solutions: Acidicity and complicated chemical matrix. Sodium, calcium, aluminum, and zirconium may interfere with cesium removal from the acidic or neutralized solution. Because of this, a thermal pretreatment option was evaluated in hopes of selectively removing cesium prior to calcine dissolution.

368 (WINCO–11933) **Effect of aluminum and silicon reactants and HIP soak time on characteristics of glass-ceramic waste forms.** Vinjamuri, K. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Apr 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-930438–30: 95. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 18-22 Apr 1993). Order Number DE94000936. Source: OSTI; NTIS; INIS; GPO Dep.

The high level liquid waste (HLLW) from nuclear fuel reprocessing is being calcined into solid granules and being stored onsite at the Idaho Chemical Processing Plant (ICPP) since 1963. Final disposal of the calcined waste in a geologic repository requires further consolidation of the calcine in to a solid waste form. One of the solid waste forms being considered for immobilization of the ICPP calcines is the glass-ceramic. The glass-ceramic waste form is a promising option because it can potentially reduce the calcined high level waste (HLW) volume significantly compared to glass waste forms while maintaining similar leach rates. Based on technical evaluations, and laboratory and pilot plant mockup tests, the Environmental Protection Agency (EPA) believes that the glass-ceramic process is more efficient than the glass process for ICPP calcine waste forms. The EPA has determined that the glass-ceramic waste form technology is an acceptable technology to meet the Best Demonstrated Acceptable Technology (BDAT) for ICPP HLW calcine. In this progress report, the impact of aluminum and silicon reactants and HIP soak time on leach rates, microstructure and phase composition of glass-ceramic waste forms are discussed.

369 (WINCO–11939) **Mixed debris treatment at the Idaho National Engineering Laboratory (INEL).** Garcia, E.C. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Porter, C.L.; Wallace, M.T. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-930873–30: 2. international mixed waste symposium, Baltimore, MD (United States), 17-20 Aug 1993). Order Number DE94000927. Source: OSTI; NTIS; INIS; GPO Dep.

August 18, 1992 the Environmental Protection Agency (EPA) published the final revised treatment standards for hazardous debris, including mixed debris. (1) Whereas previous standards had been concentration based, the revised standards are performance based. Debris must be treated prior to land disposal, using specific technologies from one or more of the following families of debris treatment technologies: Extraction, destruction, or immobilization. Seventeen specific technologies with generic application are discussed in the final rule. The existing capabilities and types of debris at the INEL were scrubbed against the debris rule to determine an overall treatment strategy. Seven types of debris were identified: combustible, porous, non-porous, inherently hazardous, HEPA filters, asbestos contaminated, and reactive metals contaminated debris. With the exception of debris contaminated with reactive metals treatment can be achieved utilizing existing facilities coupled with minor modifications.

370 (WSRC-MS–92-491) **Remote automatic control scheme for plasma arc cutting of contaminated waste.** Dudar, A.M.; Ward, C.R.; Kriikku, E.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931160–1: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94001813. Source: OSTI; NTIS; INIS; GPO Dep.

The Robotics Development Group at the Savannah River Technology Center has developed and implemented a scheme to perform automatic cutting of metallic contaminated waste. The scheme employs a plasma arc cutter in conjunction with a laser ranging sensor attached to a robotic manipulator called the Telerobot. A software algorithm using proportional control is then used to perturb the robot's trajectory in such a way as to regulate the plasma arc standoff and the robot's speed in order to achieve automatic plasma arc cuts. The scheme has been successfully tested on simulated waste materials and the results have been very favorable. This report details the development and testing of the scheme.

371 (WSRC-MS–93-284) **The use of soil gas, ground penetrating radar and cone penetrometer as screening tools prior to RFI/RI characterization at the L Area Oil and Chemical Basin: A case study, Savannah River Site, Aiken, South Carolina.** Blount, G.C.; Wise, K.M. Westinghouse Savannah River Co., Aiken, SC (United States). 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–3: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE93040910. Source: OSTI; NTIS; INIS; GPO Dep.

The L Area Oil and Chemical Basin is located within the immediate vicinity of the L Area of the Savannah River Site. The Oil and Chemical Basin is also located approximately 100 feet west of the L Area Acid/Caustic Basin. These waste units are mandated for further investigation under the SRS 3004(A)/CERCLA Program, and have been combined into one operable unit. These basins were combined because of their close proximity and the potential for commingling of contaminants.

372 (WSRC-MS–93-442) **Local strains in waste tank deflagration analysis.** Bryan, B.J.; Flanders, H.E. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9310102–25: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94001188. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years extensive effort has been expended to qualify buried nuclear waste storage tanks under accident conditions. One of these conditions is deflagration of the combustible gases which may build up over time. While much work has been done to calculate the general strain state, less effort has been made to address the local strains at structural discontinuities. An analytical method is presented for calculating these local strains and combining them with the general strain state. A closed form solution of the local strains is compared to a finite element solution.

373 (WSRC-MS–93-444) **The Mixed Waste Management Facility closure and expansion at the Savannah River Site.** Bullington, M.F.; Frye-O'Bryant, R.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–11: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001187. Source: OSTI; NTIS; INIS; GPO Dep.

The 119-acre Low-Level Radioactive Waste Disposal Facility (LLRWDF) is the disposal facility for solid, low-level radioactive waste generated at SRS. Operations, construction, and laboratory waste, such as protective clothing, decontamination residues, and analytical waste, are disposed of at LLRWDF. In 1990, the closure of the Mixed Waste Management Facility, which lies in LLRWDF, was completed in accordance with the South Carolina Hazardous Waste Regulations. The 58-acre MWMF received mixed waste from the early 1970's to 1986. The closure construction consisted of dynamically compacting the wastes to provide a stable surface and placing a low permeability cap to minimize rainwater infiltration, thus minimizing contaminant migration into the groundwater. Now, MWMF must be expanded to cover approximately 20 additional acres within LLRWDF to close trenches that received mixed wastes from 1986 until 1990. SRS plans to complete this closure similar to that used at MWMF. It has been proposed to state regulators that this closure consist of dynamic compaction and a low permeability composite cap. This Resource Conservation and Recovery Act (RCRA) closure plan was submitted to regulators in August 1993. The location and contents of the trenches to be

closed presented challenging questions to the project team. Several studies were completed to resolve these questions. The LLRWDF poster will display information and results from these studies. This paper describes closure activities for MWMF, completed in 1990, and plans proposed for expanding this closure to include the LLRWDF suspect solvent rag trenches.

374 (WSRC-MS–93-475) **Does the choice of reactor affect public acceptance of wastes?.** Inhaber, H. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-930916–1: GLOBAL '93: topical meeting on global implications of advanced nuclear fuel cycle and disposal choices, Richland, WA (United States), 12-16 Sep 1993). Order Number DE93040723. Source: OSTI; NTIS; INIS; GPO Dep.

A prime goal of this conference is to suggest future reactor types that would produce greater public acceptability. Presumably the wastes generated by these cycles would, because of lesser amounts or activities, engender fewer disputes over policy than in the past. However, the world-wide arguments over low-level wastes (LLW) suggest this intent is not likely to be achieved. While the activity of these wastes is a tiny fraction of high-level wastes (HLW), the controversies over the former, in Korea, the US and elsewhere, have been as great as for the latter. There is no linear relationship between activity and political desirability. What is needed is a new approach to disposing of and siting all nuclear wastes: LLW, mixed and HLW.

375 (WSRC-MS–93-555) **The determination of engineering parameters for the sanitary landfill, Savannah River Site.** McMullin, S.R. (Westinghouse Savannah River Co., Aiken, SC (United States)); Smalley, R.C.; Flood, P.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–24: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001816. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site is a 315 square mile, Department of Energy production facility located in western South Carolina. This facility has multiple operational areas which generate a variety of waste materials. Over the nearly 40 years of operation, sanitary wastes were deposited in a 60-acre, permitted solid waste disposal facility located on the site. Refuse and other clean wastes were deposited in shallow, slit trenches, ranging in size from 20 to 50 feet-wide and approximately 400 feet long. The historical depth of deposition appears to range between 12 and 15 feet below the ground surface. Recent changes in regulations has classified some wastes contained within the landfill as hazardous wastes, necessitating the closure of this facility as a RCRA hazardous waste management facility. The focus of this paper is to present the innovative techniques used to fully determine the engineering parameters necessary to reasonably predict future settlements, for input into the closure system design.

376 (WSRC-RP–93-542) **Pressure resulting from an ITP waste tank deflagration.** Thomas, J.K.; Hensel, S.J. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1993. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001399. Source: OSTI; NTIS; INIS; GPO Dep.

The SRS waste tanks to be employed with the In-Tank Precipitation (ITP) process are undergoing a structural evaluation in order to define their response to a hypothetical deflagration accident. At the request of the Waste Management and Environmental Remediation Division (WM&ER – High Level Waste Programs), a task was initiated to predict the peak gas pressure which would result from a deflagration (Thomas and Hensel 1993a). This report presents the final results of the deflagration peak gas pressure evaluation.

377 (WSRC-TR–92-554-Rev.1) **Comparison of options for plutonium disposal reactors.** Buckner, M.; Radder, J.A.; Inhaber, H. Westinghouse Savannah River Co., Aiken, SC (United States). Jan 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94002530. Source: OSTI; NTIS; GPO Dep.

The end of the Cold War has resulted in an excess of plutonium in the weapons stockpiles of the United States and other nations. A number of mostly reactor-based systems have been proposed to denature this plutonium, as opposed to storing and guarding it indefinitely. A Department of Energy task force has been set up to consider this problem, and the National Academy of Sciences is evaluating it as well. In this report, three major reactor types – the Advanced light Water Reactor (ALWR), the Advanced Liquid Metal Reactor (ALMR), and the Modular High-Temperature Gas Reactor (MHTGR) – are considered in terms of various qualities applicable to plutonium denaturing. These qualities include safety, management experience, waste disposal, economics, public acceptance, and others. On the basis of these considerations, it appears that the ALWR ranks at or near the top in most categories. This reactor type deserves closer consideration in terms of plutonium denaturing and disposition.

378 (WSRC-TR–93-093) **Sanitary landfill local-scale flow and transport modeling in support of alternative concentrations limit demonstrations, Savannah River Site.** Kelly, V.A. (INTERA, Inc., Austin, TX (United States)); Beach, J.A.; Statham, W.H.; Pickens, J.F. Westinghouse Savannah River Co., Aiken, SC (United States); INTERA, Inc., Austin, TX (United States). 19 Feb 1993. 376p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94002048. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) is a Department of Energy (DOE) facility located near Aiken, South Carolina which is currently operated and managed by Westinghouse Savannah River Company (WSRC). The Sanitary Landfill (Sanitary Landfill) at the SRS is located approximately 2,000 feet Northwest of Upper Three Runs Creek (UTRC) on an approximately 70 acre site located south of Road C between the SRS B-Area and UTRC. The Sanitary Landfill has been receiving wastes since 1974 and operates as an unlined trench and fill operation. The original landfill site was 32 acres. This area reached its capacity around 1987 and a Northern Expansion of 16 acres and a Southern Expansion of 22 acres were added in 1987. The Northern Expansion has not been used for waste disposal to date and the Southern Expansion is expected to reach capacity in 1992 or 1993. The waste received at the Sanitary Landfill is predominantly paper, plastics, rubber, wood, metal, cardboard, rags saturated with degreasing solvents, pesticide bags, empty cans, and asbestos in bags. The landfill is not supposed to receive any radioactive wastes. However, tritium has been detected in the groundwater at the site. Gross alpha and gross beta are also evaluated at the landfill. The objectives of this modeling study are twofold: (1) to create a local scale Sanitary Landfill flow model to study hydraulic effects resulting from capping the Sanitary Landfill; and (2) to create a Sanitary Landfill local scale transport model to support ACL Demonstrations for a RCRA Part B Permit Renewal.

379 (WSRC-TR–93-0111-Rev.1) **Facts and issues of direct disposal of spent fuel: Revision 1.** Parks, P.B. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1993. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001176. Source: OSTI; NTIS; INIS; GPO Dep.

This report reviews those facts and issues that affect the direct disposal of spent reactor fuels. It is intended as a resource document for those impacted by the current Department of Energy (DOE) guidance that calls for the cessation of fuel reprocessing. It is not intended as a study of the specific impacts (schedules and costs) to the Savannah River Site (SRS) alone. Commercial fuels, other low enriched fuels, highly enriched defense-production, research, and naval reactor fuels are included in this survey, except as prevented by rules on classification.

380 (YJT–93-13) **Sorption of Cs, U, Np and Pu and diffusion of water, Cs and Np in basic plutonic rocks and vulcanite.** Kaukonen, V. (Helsinki Univ. (Finland). Dept. of Radiochemistry); Hakanen, M.; Lindberg, A. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Jul 1993. 68p. Order Number DE94606165. Source: OSTI; NTIS; INIS.

Sorption of cesium, neptunium, plutonium and uranium on crushed basic rocks from Maentsaelae, Syyry and Sodankylae (in

Finland) was investigated under oxic and anoxic conditions. Diffusion of of tritium (tritiated water), cesium and neptunium in drill core prepared of the same rocks was studied under oxic conditions. The study is a part of the preliminary site investigations for the radioactive waste disposal in Finnish bedrock.

0530 Environmental Aspects

Refer also to citation(s) 167, 357, 396, 400, 403, 408, 412, 418, 432, 1959, 1980, 1981, 2086, 2093, 2802

381 (ES/ESH–31/V1) **Oak Ridge Reservation environmental report for 1992: Volume 1: Narrative.** Koncinski, W.S. (ed.). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Sep 1993. 389p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001847. Source: OSTI; NTIS; INIS; GPO Dep.

The two volumes of this report present data and supporting narratives regarding the impact of the US Department of Energy's (DOE's) Oak Ridge Reservation (ORR) on its environs and the public during 1992. This Volume (Volume 1) includes all narrative descriptions, summaries, and conclusions and is intended to be a "stand-alone" report for the reader who does not want to review in detail all of the 1992 data for the ORR. Volume 2 includes the detailed data in formats that ensure all the environmental data are represented. Narratives are not included in Vol. 2.

382 (ES/ESH–31/V2) **Oak Ridge Reservation environmental report for 1992: Volume 2: Data presentation.** Koncinski, W.S. (ed.). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Sep 1993. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001848. Source: OSTI; NTIS; INIS; GPO Dep.

The two volumes of this report present data and supporting narratives regarding the impact of the US Department of Energy's (DOE's) Oak Ridge Reservation (ORR) on its environs and the public during 1992. Volume 1 includes all narrative descriptions, summaries, and conclusions and is intended to be a "stand-alone" report for the reader who does not want to review in detail all of the 1992 data for the ORR. This volume (volume 2) includes the detailed data in formats that ensure all the environmental data are presented. Narratives are not included in Vol. 2.

383 (EUR–14690) **Migration of radionuclides in the geosphere.** Maravic, H. von (Commission of the European Communities, Brussels (Belgium)); Moreno, J. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 183p. (In English, French). (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). Source: OSTI; NTIS (US Sales Only); INIS.

This report contains 13 papers presented at the plenary meeting on the coordinated project MIRAGE (Migration of Radionuclides in the Geosphere) which is in its third phase in the frame work of the 4th five year research program on management and disposal of radioactive waste (1990-1994). 12 papers in the INIS scope have been analyzed and describe the present status of various research activities, within the large integrated multinational subprojects such as: Colloids and organic materials in aquifer systems, processes of geochemical modelling (CHEMVAL project), migration experiments through different geological media, natural analogue studies.

384 (HW–24800-97) **Design and construction history, Aquatic Biology Laboratory: Project C-364, December 31, 1951.** Hanford Works, Richland, WA (United States). Jan 1952. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001619. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The GE Nucleonics Division Staff Department which now is called the Radiological Sciences Department was formerly known as the "Health Instrument Divisions. A part of this department, presently known as the Biology Section, was formerly identified as the "Biology Division." This project is concerned with a laboratory facility which is being built for the use of the Aquatic Biology Unit of the Biology Section. The Aquatic Biology group was established in 1945 to study the effect of the pile effluent on the Columbia River salmon industry. A hutment was erected to provide space for a laboratory, fish troughs, equipment, offices, and service. Thirteen outside ponds were built. Although minor improvements were subsequently added to the original facility, the expansion of the plant did not keep pace with the expansion in the operating program. This inadequacy gave rise to the project hereafter described.

385 (PNL–8797) **Radiological survey of shoreline vegetation from the Hanford Reach of the Columbia River, 1990–1992.** Antonio, E.J.; Poston, T.M.; Rickard, W.H. Jr. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000349. Source: OSTI; NTIS; INIS; GPO Dep.

A great deal of interest exists concerning the seepage of radiologically contaminated groundwater into the Columbia River where it borders the US Department of Energy's Hanford Site (Hanford Reach). Areas of particular interest include the 100-N Area, the Old Hanford Townsite, and the 300 Area springs. While the radiological character of the seeps and springs along the Hanford Site shoreline has been studied, less attention has been given to characterizing the radionuclides that may be present in shoreline vegetation. The objective of this study was to characterize radionuclide concentrations in shoreline plants along the Hanford Reach of the Columbia River that were usable by humans for food or other purposes. Vegetation in two areas was found to have elevated levels of radionuclides. Those areas were the 100-N Area and the Old Hanford Townsite. There was also some indication of uranium accumulation in milfoil and onions collected from the 300 Area. Tritium was elevated above background in all areas; ^{60}Co and ^{90}Sr were found in highest concentrations in vegetation from the 100-N Area. Technetium-99 was found in 2 of 12 plants collected from the Old Hanford Townsite and 1 of 10 samples collected upstream from the Vernita Bridge. The concentrations of ^{137}Cs, ^{238}Pu, $^{239,240}Pu$, and isotopes of uranium were just above background in all three areas (100-N Area, Old Hanford Townsite, and 300 Area).

386 (PNWD–1980-12-HEDR) **Hanford Environmental Dose Reconstruction Project: Quarterly report, June–August 1993.** Cannon, S.D.; Finch, S.M. (comps.). Pacific Northwest Lab., Richland, WA (United States). 1993. 63p. Sponsored by Department of Health and Human Services, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000624. Source: OSTI; NTIS; GPO Dep.

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation doses that individuals and populations could have received from nuclear operations at Hanford since 1944. The project is divided into the following technical tasks. These tasks correspond to the path radionuclides followed from release to impact on humans (dose estimates): Source Terms, Environmental Transport, Environmental Monitoring Data, Demography, Food Consumption, and Agriculture, and Environmental Pathways and Dose Estimates.

387 (RFP–4746) **A risk comparison for startup of plutonium thermal stabilization operations.** Elia, F. Jr. (Stone and Webster Engineering Corp., Boston, MA (United States)); Foppe, T.L.; Stahlnecker, E. EG and G Rocky Flats, Inc., Golden, CO (United States). Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-931121–14: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE93018802. Source: OSTI; NTIS; GPO Dep.

Plutonium production operations at the Rocky Flats Plant were curtailed in 1989 by the Department of Energy so that a new operating contractor, EG&G Rocky Flats Inc., could assess the safety of resuming plutonium operations and implement a new safety culture consistent with nuclear reactor practices. In 1992, the Plant's mission was changed to decommissioning, decontamination, and environmental restoration. In order to support this new mission, a safety analysis for Building 707 required rebaselining of the risk of resuming thermal stabilization of pyrophoric forms of plutonium by electrical heating in an air environment, as well as other activities to support the building in a standby and interim storage mode. The general approach was to update the safety analysis that rebaselined risks from fires, explosions, spills, criticalities, and seismic

events for the previous production mission. Event tree analyses of the risk dominant scenarios were modified to establish accident sequence frequencies for the new mission. Radiological source terms were revised to reflect the quantities of plutonium at risk for the new mission. While the total amount of plutonium metal is reduced due to the mission change, the amount of plutonium oxide powder is expected to be greater. Radiological consequences and risks were analyzed with the MELCOR Accident Consequence Code System (MACCS) computer code for the dose to the maximum offsite individual and the latent cancer fatality risks to the population within 10 and 50 miles. Risk information was presented in terms of mean risk estimates and risk curves. A comparison of risks was then made to the NUREG-1150 risk curves from severe accident analysis of power reactors and to the Department of Energy SEN-35-91 quantitative safety goals. Also, a comparison was made to the expected number of fatalities caused by commercial and residential building collapses due to the seismic event itself in populated areas around the Rocky Flats Plant.

388 (WHC-SA–1792) **Statistical application of groundwater monitoring data at the Hanford Site.** Chou, C.J.; Johnson, V.G.; Hodges, F.N. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931002–1: Geological Society of America annual meeting, Boston, MA (United States), 25-28 Oct 1993). Order Number DE94001698. Source: OSTI; NTIS; INIS; GPO Dep.

Effective use of groundwater monitoring data requires both statistical and geohydrologic interpretations. At the Hanford Site in south-central Washington state such interpretations are used for (1) detection monitoring, assessment monitoring, and/or corrective action at Resource Conservation and Recovery Act sites; (2) compliance testing for operational groundwater surveillance; (3) impact assessments at active liquid-waste disposal sites; and (4) cleanup decisions at Comprehensive Environmental Response Compensation and Liability Act sites. Statistical tests such as the Kolmogorov-Smirnov two-sample test are used to test the hypothesis that chemical concentrations from spatially distinct subsets or populations are identical within the uppermost unconfined aquifer. Experience at the Hanford Site in applying groundwater background data indicates that background must be considered as a statistical distribution of concentrations, rather than a single value or threshold. The use of a single numerical value as a background-based standard ignores important information and may result in excessive or unnecessary remediation. Appropriate statistical evaluation techniques include Wilcoxon rank sum test, Quantile test, "hot spot" comparisons, and Kolmogorov-Smirnov types of tests. Application of such tests is illustrated with several case studies derived from Hanford groundwater monitoring programs. To avoid possible misuse of such data, an understanding of the limitations is needed. In addition to statistical test procedures, geochemical, and hydrologic considerations are integral parts of the decision process. For this purpose a phased approach is recommended that proceeds from simple to the more complex, and from an overview to detailed analysis.

389 (WHC-SD-EN-SD–001) **Hanford Environmental Information System (HEIS) sample/data entry flow summary.** Key, K.T. Westinghouse Hanford Co., Richland, WA (United States). [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002494. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this summary is to present a unified overview of the processes that ultimately lead to the loading and storage of the Hanford environmental data on the Hanford Environmental Information System (HEIS) database and the Hanford Groundwater Database (HGWDB). The relationships among the various organizations involved in the process and the functions they perform with respect to these databases are delineated. As such, this summary can be used to support the activities of the overall Hanford environmental data management, either by the various WHC departments or by PNL, with the ultimate goal of integrating the totality of the Hanford environmental data onto the HEIS database.

0540 Health and Safety

Refer also to citation(s) 182, 197, 231, 245, 246, 276, 287, 290, 297, 305, 310, 316, 344, 349, 352, 353, 358, 359, 371, 372, 376, 381, 387, 508, 778, 783, 785, 845, 1374, 1375, 1403, 1953, 1956, 1971, 1972, 2083, 2184, 2194, 2199, 2229, 2230

390 (ANL/CMT/CP–80310) **Innovative environmental restoration and waste management technologies at Argonne National Laboratory.** Helt, J.E. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310179–1: CONEC '93: conference on environmental commerce, Chattanooga, TN (United States), 17-20 Oct 1993). Order Number DE93041171. Source: OSTI; NTIS; INIS; GPO Dep.

Cleanup of contaminated sites and management of wastes have become major efforts of the US Department of Energy. Argonne National Laboratory (ANL) is developing several new technologies to meet the needs of this national effort. Some of these efforts are being done in collaboration with private sector firms. An overview of the ANL and private sector efforts will be presented. The following four specific technologies will be discussed in detail: (1) a minimum additive waste stabilization (MAWS) system for treating actinide-contaminated soil and groundwater; (2) a magnetic separation system, also for cleanup of actinide-contaminated soil and groundwater; (3) a mobile evaporator/concentrator system for processing aqueous radioactive and mixed waste; and (4) a continuous emission monitor for ensuring that waste incineration meets environmental goals.

391 (ANL/EA/CP–78779) **A comparison of radiological risk assessment methods for environmental restoration.** Dunning, D.E. Jr.; Peterson, J.M. Argonne National Lab., IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930746–3: Annual meeting of the Health Physics Society (HPS), Atlanta, GA (United States), 11-15 Jul 1993). Order Number DE93040823. Source: OSTI; NTIS; INIS; GPO Dep.

Evaluation of risks to human health from exposure to ionizing radiation at radioactively contaminated sites is an integral part of the decision-making process for determining the need for remediation and selecting remedial actions that may be required. At sites regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a target risk range of 10^{-4} to 10^{-6} incremental cancer incidence over a lifetime is specified by the US Environmental Protection Agency (EPA) as generally acceptable, based on the reasonable maximum exposure to any individual under current and future land use scenarios. Two primary methods currently being used in conducting radiological risk assessments at CERCLA sites are compared in this analysis. Under the first method, the radiation dose equivalent (i.e., Sv or rem) to the receptors of interest over the appropriate period of exposure is estimated and multiplied by a risk factor (cancer risk/Sv). Alternatively, incremental cancer risk can be estimated by combining the EPA's cancer slope factors (previously termed potency factors) for radionuclides with estimates of radionuclide intake by ingestion and inhalation, as well as radionuclide concentrations in soil that contribute to external dose. The comparison of the two methods has demonstrated that resulting estimates of lifetime incremental cancer risk under these different methods may differ significantly, even when all other exposure assumptions are held constant, with the magnitude of the discrepancy depending upon the dominant radionuclides and exposure pathways for the site. The basis for these discrepancies, the advantages and disadvantages of each method, and the significance of the discrepant results for environmental restoration decisions are presented.

392 (ANL/EA/CP–79850) **Aquifer characterization and groundwater modeling in support of remedial actions at the Weldon Spring Site.** Durham, L.A. (Argonne National Lab., IL (United States)); Carman, J.D. Argonne National Lab., IL (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001278. Source: OSTI; NTIS; INIS; GPO Dep.

Aquifer characterization studies were performed to develop a hydrogeologic understanding of an unconfined shallow aquifer at the

Weldon Spring site west of St. Louis, Missouri. The 88-ha site became contaminated because of uranium and thorium processing and disposal activities that took place from the 1940s through the 1960s. Slug and pumping tests provided valuable information on the lateral distribution of hydraulic conductivities, and packer tests and lithologic information were used to determine zones of contrasting hydrologic properties within the aquifer. A three-dimensional, finite-element groundwater flow model was developed and used to simulate the shallow groundwater flow system at the site. The results of this study show that groundwater flow through the system is predominantly controlled by a zone of fracturing and weathering in the upper portion of the limestone aquifer- The groundwater flow model, developed and calibrated from field investigations, improved the understanding of the hydrogeology and supported decisions regarding remedial actions at the site. The results of this study illustrate the value, in support of remedial actions, of combining field investigations with numerical modeling to develop an improved understanding of the hydrogeology at the site.

393 (ANL/EA/CP–79944) **Modeling emissions and dispersion of contaminants from cleanup activities at a mixed waste site to estimate air impacts and risks.** Chang, Y.S. (Argonne National Lab., IL (United States)); Menlove, S. Argonne National Lab., IL (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–14: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001273. Source: OSTI; NTIS; INIS; GPO Dep.

The transport and dispersion of contaminants via the air pathway is a major concern during cleanup of contaminated sites. Impacts to air quality and human health during cleanup were evaluated for the Weldon Spring site by using site-specific information for source areas, activities, and receptor locations. In order to ensure protection of human health and the environment, results are being used to focus on those cleanup activities for which release controls should be emphasized.

394 (ANL/EAIS/CP–79748) **The strategy for assessing risks associated with remediation of the former production area at Fernald.** Davis, M. (Argonne National Lab., IL (United States)); Avci, H.; Picel, K.; Janke, R.J. Argonne National Lab., IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–18: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001292. Source: OSTI; NTIS; INIS; GPO Dep.

The strategy for assessing the risks associated with the remediation of the former Production Area at the Fernald Environmental Management Project is discussed. The general approach to risk assessment is strongly influenced by a number of factors related to the nature of the site and to management proposals that have been made concerning the site. How these factors affect the approach to assessing baseline risks, to assessing risks associated with remedial activity, and to establishing cleanup criteria are examined.

395 (ANL/FE/CP–79340) **Seismic modifications to the hot suspect repair area Argonne National Laboratory, West.** Malik, L.E. (Advanced Engineering Consultants, San Francisco, CA (United States)); Harris, B.G. Argonne National Lab., Idaho Falls, ID (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310102–27: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94001344. Source: OSTI; NTIS; INIS; GPO Dep.

The ANL-W WIPP Waste Facility Enhancement Project required substantial remodeling and upgrades to the Hot Fuels Examination Facility (HFEF) building, including the Hot and Suspect Repair Area (HSRA). The HSRA is an enclosed single-stoned area inside the HFEF. It is separated into several compartments, some of which are used for handling radioactive materials. The HSRA roof consists of 18 GA steel Robertson Q decking with 1.5 in. concrete topping, and is utilized for storage. Braced steel frames support the HSRA roof, except at the north side, where the steel beams arc connected to the HFEF columns. The HSRA has hollow block masonry perimeter and interior walls. Seismic evaluations concluded that the HSRA did not have a competent seismic force resisting system. The structure was upgraded by decoupling it from the HFEF framing for N/S motions, modifying two existing braced frames, adding a now braced frame that can be removed temporarily during maintenance and strengthening the roof diaphragm by a unique modification consisting of special epoxy grout and steel plates installed over the existing concrete roof.

396 (DOE/AL–0347) **Environmental assessment of remedial action at the Maybell uranium mill tailings site near Maybell, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001479. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this environmental assessment (EA) is to evaluate the environmental impacts resulting from remedial action at the Maybell uranium mill tailings site near Maybell, Colorado. A biological assessment (Attachment 1) and a floodplain/wetlands assessment (Assessment 2) are included as part of this EA. The following sections and attachments describe the proposed action, affected environment, and environmental impacts associated with the proposed remedial action, including impacts to threatened and endangered species listed or proposed for listing by the US Fish and Wildlife Service.

397 (DOE/AL/62350–9F) **Licensing plan for UMTRA project disposal sites: Final [report].** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001477. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project Office developed a plan to define UMTRA Project licensing program objectives and establish a process enabling the DOE to document completion of remedial actions in compliance with 40 CFR 1 92 and the requirements of the NRC general license. This document supersedes the January 1987 Project Licensing Plan (DOE, 1987). The plan summarizes the legislative and regulatory basis for licensing, identifies participating agencies and their roles and responsibilities, defines key activities and milestones in the licensing process, and details the coordination of these activities. This plan provides an overview of the UMTRA Project from the end of remedial actions through the NRC's acceptance of a disposal site under the general license. The licensing process integrates large phases of the UMTRA Project. Other programmatic UMTRA Project documents listed in Section 6.0 provide supporting information.

398 (DOE/AL/62350–32D) **Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project.** USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office. Sep 1993. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001509. Source: OSTI; NTIS; INIS; GPO Dep.

Public concern regarding the potential human health and environmental effects from uranium mill tailings led Congress to pass the Uranium Mill Tailings Radiation Control Act (UMTRCA) (Public Law 95-604) in 1978. In the UMTRCA, Congress acknowledged the potentially harmful health effects associated with uranium mill tailings at 24 abandoned uranium mill processing sites needing remedial action. Uranium processing activities at most of the 24 mill processing sites resulted in the formation of contaminated ground water beneath and, in some cases, downgradient of the sites. This contaminated ground water often has elevated levels of hazardous constituents such as uranium and nitrate. The purpose of the Ground Water Project is to protect human health and the environment by meeting EPA-proposed standards in areas where ground water has been contaminated with constituents from UMTRA Project sites. A major first step in the UMTRA Ground Water Project is the preparation of this Programmatic Environmental Impact Statement (PEIS). This document analyzes potential impacts of the alternatives, including the proposed action. These alternatives are programmatic in that they are plans for conducting the UMTRA Ground Water Project. The alternatives do not address site-specific ground water compliance. This PEIS is a planning document that will provide a framework for conducting the Ground

Water Project; assess the potential programmatic and environmental impacts of conducting the UMTRA Ground Water Project; provide a method for determining the site-specific ground water compliance strategies; and provide data and information that can be used to prepare site-specific environmental impacts analyses documents more efficiently.

399 (DOE/AL/62350–38F) **Technical assistance contractor Management Plan: Final [report].** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001478. Source: OSTI; NTIS; INIS; GPO Dep.

The Technical Assistance Contractor (TAC) for the Uranium Mill Tailings Remedial Action (UMTRA) Project comprises Jacobs Engineering Group Inc. (JEG) and its major teaming partners [Roy F. Weston, Inc. (RFW), Sergent, Hauskins & Beckwith Agra, Inc. (SHB Agra), and Geraghty & Miller, Inc. (G&M)]. The first three companies have worked together effectively on the UMTRA Project for more than 10 years. With the initiation of the UMTRA Groundwater Project in April 1991, a need arose to increase the TAC's groundwater technical breadth and depth, so G&M was brought in to augment the team's capabilities. The TAC contract's scope is to provide technical, analytical, environmental, engineering, design, inspection, and management support services to the US Department of Energy (DOE) for both surface and groundwater projects. The TAC team continues to support the DOE in completing surface remedial actions and initiating groundwater remediation work for start-up, characterization, design, construction oversight, and remedial operations. A key feature of the TAC's management approach is the extensive set of communication systems implemented for the UMTRA Project. These systems assist all functional disciplines in performing UMTRA Project tasks associated with management, technical support, administrative support, and financial/project controls.

400 (DOE/AL/62350–43D) **Baseline risk assessment for groundwater contamination at the uranium mill tailings site near Monument Valley, Arizona: Draft.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001510. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment evaluates potential impact to public health or the environment resulting from groundwater contamination at the former uranium mill processing site near Monument Valley, Arizona. The tailings and other contaminated material at this site are being relocated and stabilized in a disposal cell at Mexican Hat, Utah, through the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The tailings removal is planned for completion by spring 1994. After the tailings are removed, groundwater contamination at the site will continue to be evaluated. This risk assessment is the first document specific to this site for the Groundwater Project. It will be used to assist in determining what remedial action is needed for contaminated groundwater at the site.

401 (DOE/AL/62350–48D) **Baseline risk assessment of groundwater contamination at the uranium mill tailings site near Shiprock, New Mexico: Draft.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001513. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates potential impact to public health or the environment resulting from groundwater contamination at the former uranium mill processing site. The tailings and other contaminated material at this site were placed in a disposal cell on the site in 1986 by the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. Currently, the UMTRA Project is evaluating groundwater contamination. This risk assessment is the first document specific to this site for the Groundwater Project. This risk assessment follows the approach outlined by the US Environmental Protection Agency (EPA). The first step is to evaluate groundwater data collected from monitor wells at the site. Evaluation of these data showed that the main contaminants in the floodplain groundwater are arsenic, magnesium, manganese, nitrate, sodium, sulfate, and uranium. The complete list of contaminants associated with the terrace groundwater could not be determined due to the lack of the background groundwater quality data. However, uranium, nitrate, and sulfate are evaluated since these chemicals are clearly associated with uranium processing and are highly elevated compared to regional waters. It also could not be determined if the groundwater occurring in the terrace is a usable water resource, since it appears to have originated largely from past milling operations. The next step in the risk assessment is to estimate how much of these contaminants people would be exposed to if a drinking well were installed in the contaminated groundwater or if there were exposure to surface expressions of contaminated water. Potential exposures to surface water include incidental contact with contaminated water or sediments by children playing on the floodplain and consumption of meat and milk from domestic animals grazed and watered on the floodplain.

402 (DOE/AL/62350–53F) **Site-specific analysis of radiological and physical parameters for cobbly soils at the Gunnison, Colorado, processing site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1993. 326p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001511. Source: OSTI; NTIS; INIS; GPO Dep.

The remedial action at the Gunnison, Colorado, processing site is being performed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 [Public Law (PL) 95-6041]. Under UMTRCA, the US Environmental Protection Agency (EPA) is charged with the responsibility of developing appropriate and applicable standards for the cleanup of radiologically contaminated land and buildings at 24 designated sites, including the Gunnison, Colorado, inactive processing site. The remedial action at the processing site will be conducted to remove the tailings and contaminated materials to meet the EPA bulk soil cleanup standards for surface and subsurface soils. The site areas disturbed by remedial action excavation will be either contoured or backfilled with radiologically uncontaminated soil and contoured to restore the site. The final contours will produce a final surface grade that will create positive drainage from the site.

403 (DOE/AL/62350–54D) **UMTRA water sampling and analysis plan, Tuba City, Arizona: Draft.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001508. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide background, guidance, and justification for fiscal year (FY) 1994 water sampling activities for the uranium mil tailings site at Tuba City, Arizona. This sampling and analysis plan will form the basis for groundwater sampling and analysis work orders to be implemented in FY94.

404 (DOE/AL/62350–68F) **Surface and subsurface cleanup protocol for radionuclides, Gunnison, Colorado, UMTRA project processing site: Final [report].** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 399p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001512. Source: OSTI; NTIS; INIS; GPO Dep.

Surface and subsurface soil cleanup protocols for the Gunnison, Colorado, processing sits are summarized as follows: In accordance with EPA-promulgated land cleanup standards (40 CFR 192), in situ Ra-226 is to be cleaned up based on bulk concentrations not exceeding 5 and 15 pCi/g in 15-cm surface and subsurface depth increments, averaged over 100-m^2 grid blocks, where the parent Ra-226 concentrations are greater than, or in secular equilibrium with, the Th-230 parent. A bulk interpretation of these EPA standards has been accepted by the Nuclear Regulatory Commission (NRC), and while the concentration of the finer-sized soil fraction less than a No. 4 mesh sieve contains the higher concentration of radioactivity, the bulk approach in effect integrates the total sample radioactivity over the entire sample mass. In locations where Th-230 has differentially migrated in subsoil relative to Ra-226, a Th-230 cleanup protocol has been developed in accordance with Supplemental Standard provisions of 40 CFR 192

for NRC/Colorado Department of Health (CDH) approval for timely implementation. Detailed elements of the protocol are contained in Appendix A, Generic Protocol from Thorium-230 Cleanup/ Verification at UMTRA Project Processing Sites. The cleanup of other radionuclides or nonradiological hazards that pose a significant threat to the public and the environment will be determined and implemented in accordance with pathway analysis to assess impacts and the implications of ALARA specified in 40 CFR 192 relative to supplemental standards.

405 (DOE/AL/62350–70F) **Guidance document for preparing water sampling and analysis plans for UMTRA sites: Final [report].** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94001481. Source: OSTI; NTIS; INIS; GPO Dep.

A water sampling and analysis plan (WSAP) is required for each Uranium Mill Tailings Remedial Action (UMTRA) site to provide rationale for groundwater and surface water sampling at disposal sites and former processing sites. The WSAP identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequencies for the groundwater and surface water monitoring stations at each site. Section 2.0 of this WSAP Guidance Document describes the WSAP format. Sections 3.0 and 4.0 provide guidance for selecting sampling frequencies and sampling locations, respectively. Section 5.0 contains criteria for selecting analytical parameters. Section 6.0 provides guidance for the contents of each site's WSAP file. Finally, Section 7.0 presents the references used to prepare this document. The purpose of this guidance document is to provide a consistent technical approach for sampling and monitoring activities performed under WSAPs and a consistent format for WSAP documents. This document is designed for use by the Technical Assistance Contractor (TAC) to prepare WSAPs and by the US Department of Energy (DOE), Nuclear Regulatory Commission, state and tribal agencies, regulatory agencies, and the public to evaluate the contents of the WSAPS. This guidance document may be updated periodically based on new or changing regulations.

406 (DOE/CH–9206) **Electrokinetic treatment of contaminated soils, sludges, and lagoons: Final report.** Wittle, J.K. (Electro-Petroleum, Inc., Wayne, PA (United States)); Pamukcu, S. Electro-Petroleum, Inc., Wayne, PA (United States); Lehigh Univ., Bethlehem, PA (United States). Dept. of Civil Engineering. Apr 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040739. Source: OSTI; NTIS; INIS; GPO Dep.

The electrokinetic process is an emerging technology for in-situ soil decontamination, in which chemical species, both ionic and nonionic are transported to an electrode site in soil. These products are subsequently removed from the ground via collection systems engineered for each specific application. Electrokinetics refer to movement of water, ions and charged particles relative to one another under the action of an applied direct current electric field. In a porous compact matrix of surface charged particles such as soil, the ion containing pore fluid may be made to flow to collection sites under the applied field. This report describes the effort undertaken to investigate electrokinetically enhanced transport of soil contaminants in synthetic systems. These systems consisted of clay or clay-sand mixtures containing known concentration of a selected heavy metal salt solution or an organic compound. Metals, surrogate radio nuclides and organic compounds evaluated in the program were representatives of those found at a majority of DOE sites. Degree of removal of these metals from soil by the electrokinetic treatment process was assessed through the metal concentration profiles generated across the soil between the electrodes. The best removals, from about 85 to 95% were achieved at the anode side of the soil specimens. Transient pH change had an effect on the metal movement via transient creation of different metal species with different ionic mobilities, as well as changing of the surface characteristics of the soil medium.

407 (DOE/EA–0339) **Environmental assessment of remedial action at the Slick Rock uranium mill tailings sites Slick Rock, Colorado: Draft.** USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office; Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1993. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE93041026. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) authorized the US Department of Energy (DOE) to clean up two uranium mill tailings processing sites near Slick Rock, Colorado, in San Miguel County. The purpose of the cleanup is to reduce the potential health effects associated with the radioactive materials remaining on the sites and on vicinity properties (VP) associated with the sites. The US Environmental Protection Agency (EPA) promulgated standards for the UMTRCA that contained measures to control the contaminated materials and to protect the groundwater from further degradation. Remedial actions at the Slick Rock sites must be performed in accordance with these standards and with the concurrence of the US Nuclear Regulatory Commission (NRC).

408 (DOE/EA–0464-Rev.1) **Environmental assessment of remedial action at the Naturita Uranium processing site near Naturita, Colorado: Revision 1.** USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office; Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1993. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE93041037. Source: OSTI; NTIS; INIS; GPO Dep.

The proposed remedial action for the Naturita processing site is relocation of the contaminated materials and debris to the Dry Flats disposal site, 6 road miles (mi) [1 0 kilometers (km)] to the southeast. At the disposal site, the contaminated materials would be stabilized and covered with layers of earth and rock. The proposed disposal site is on land administered by the Bureau of Land Management (BLM) and used primarily for livestock grazing. The final disposal site would cover approximately 57 ac (23 ha), which would be permanently transferred from the BLM to the DOE and restricted from future uses. The remedial action activities would be conducted by the DOE's Uranium Mill Tailings Remedial Action (UMTRA) Project. The remedial action would result in the loss of approximately 164 ac (66 ha) of soils, but 132 ac (53 ha) of these soils are contaminated and cannot be used for other purposes. Another 154 ac (62 ha) of soils would be temporarily disturbed. Approximately 57 ac (23 ha) of open range land would be permanently removed from livestock grazing and wildlife use. The removal of the contaminated materials would affect the 1 00-year floodplain of the San Miguel River and would result in the loss of riparian habitat along the river. The southwestern willow flycatcher, a Federal candidate species, may be affected by the remedial action, and the use of water from the San Miguel River "may affect" the Colorado squawfish, humpback chub, bonytail chub, and razorback sucker. Traffic levels on State Highways 90 and 141 would be increased during the remedial action, as would the noise levels along these transportation routes. Measures for mitigating the adverse environmental impacts of the proposed remedial action are discussed in Section 6.0 of this environmental assessment (EA).

409 (DOE/EA–0785) **Environmental assessment for the decommissioning and decontamination of contaminated facilities at the Laboratory for Energy-Related Health Research University of California, Davis.** Battelle Memorial Inst., Richland, WA (United States). Sep 1992. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93016873. Source: OSTI; NTIS; INIS; GPO Dep.

The Laboratory for Energy-Related Health Research (LEHR) was established in 1958 at its present location by the Atomic Energy Commission. Research at LEHR originally focused on the health effects from chronic exposures to radionuclides, primarily strontium 90 and radium 226, using beagles to simulate radiation effects on humans. In 1988, pursuant to a memorandum of agreement between the US Department of Energy (DOE) and the University of California, DOE's Office of Energy Research decided to close out the research program, shut down LEHR, and turn the facilities and site over to the University of California, Davis (UCD) after remediation. The decontamination and decommissioning (D&D) of LEHR will be managed by the San Francisco Operations Office (SF) under DOE's Environmental Restoration Program. This environmental

assessment (EA) addresses the D&D of four site buildings and a tank trailer, and the removal of the on-site cobalt 60 (Co-60) source. Future activities at the site will include D&D of the Imhoff building and the outdoor dog pens, and may include remediation of underground tanks, and the landfill and radioactive disposal trenches. The remaining buildings on the LEHR site are not contaminated. The environmental impacts of the future activities cannot be determined at this time because the extent of contamination has not yet been ascertained. The impacts of these future activities (including the cumulative impacts of the future activities and those addressed in this EA) will be addressed in future National Environmental Policy Act (NEPA) documentation.

410 (DOE/EA–0854) **Finding of no significant impact for the interim action for cleanup of Pit 9 at the Radioactive Waste Management Complex, Idaho National Engineering Laboratory.** USDOE, Washington, DC (United States). [1993]. 65p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001265. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has prepared an environmental assessment (EA), DOE/EA-0854, for an interim action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The proposed action would be conducted at Pit 9, Operable Unit 7–10, located at the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). The proposed action consists of construction of retrieval and processing buildings, excavation and retrieval of wastes from Pit 9, selective physical separation and chemical extraction, and stabilization of wastes either through thermal processing or by forming a stabilized concentrate. The proposed action would involve limited waste treatment process testing and full-scale waste treatment processing for cleaning up pre-1970 Transuranic (TRU) wastes in Pit 9. The purpose of this interim action is to expedite the overall cleanup at the RWMC and to reduce the risks associated with potential migration of Pit 9 wastes to the Snake River Plain Aquifer.

411 (DOE/EA–0881) **Tank 241-C-103 organic vapor and liquid characterization and supporting activities, Hanford Site, Richland, Washington: Environmental Assessment.** USDOE, Washington, DC (United States). 10 Aug 1993. 52p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001263. Source: OSTI; NTIS; INIS; GPO Dep.

The action proposed is to sample the vapor space and liquid waste and perform other supporting activities in Tank 241-C-103 located in the 241-C Tank Farm on the Hanford Site. Operations at Tank 241-C-103 are curtailed because of an unreviewed safety question (USQ) concerning flammability issues of the organic waste in the tank. This USQ must be resolved before normal operation and surveillance of the tank can resume. In addition to the USQ, Tank 241-C-103 is thought to be involved in several cases of exposure of individuals to noxious vapors. This safety issue requires the use of supplied air for workers in the vicinity of the tank. Because of the USQ, the US Department of Energy proposes to characterize the waste in the vapor space and the organic and aqueous layers, to determine the volume of the organic layer. This action is needed to: (1) assess potential risks to workers, the public, and the environment from continued routine tank operations and (2) provide information on the waste material in the tank to facilitate a comprehensive safety analysis of this USQ. The information would be used to determine if a flammable condition within the tank is credible. This information would be used to prevent or mitigate an accident during continued waste storage and future waste characterization. Alternatives to the proposed activities have been considered in this analysis.

412 (DOE/EIS–0185F) **Responses to comments on the remedial investigation/feasibility study-environmental impact statement for remedial action at the Chemical Plant area of the Weldon Spring site (November 1992).** USDOE Oak Ridge Field Office, TN (United States); Argonne National Lab., IL (United States). Jun 1993. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21548 ;W-31109-ENG-38. Order Number DE94001264. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is responsible for cleanup activities at the Weldon Spring site in St. Charles County, Missouri. The site consists of a chemical plant area and a noncontiguous limestone quarry; both areas are radioactively and chemically contaminated as a result of past processing and disposal activities. Explosives were produced by the US Army at the chemical plant in the 1940s, and uranium and thorium materials were processed by DOE's predecessor agency in the 1950s and 1960s. During that time, various wastes were disposed of at both areas of the site. The DOE is conducting cleanup activities at the site under its Environmental Restoration and Waste Management Program. The integrated remedial investigation/feasibility study-environmental impact statement (RI/FS-EIS) documents for the chemical plant area were issued to the public in November 1992 as the draft RI/FS-EIS. (The CERCLA RI/FS is considered final when issued to the public, whereas per the NEPA process, an EIS is initially issued as a draft and is finalized after substantive public comments have been addressed.) Four documents made up the draft RI/FS-EIS, which is hereafter referred to as the RI/FS-EIS: (1) the RI (DOE 1992d), which presents general information on the site environment and the nature and extent of contamination; (2) the baseline assessment (BA) (DOE 1992a), which evaluates human health and environmental effects that might occur if no cleanup actions were taken; (3) the FS (DOE 1992b), which develops and evaluates alternatives for site cleanup; and (4) the proposed plan (PP) (DOE 1992c), which summarizes key information from the RI, BA, and FS reports and identifies DOE's preferred alternative for remedial action. This comment response document combined with those four documents constitutes the final RI/FS-EIS for the chemical plant area.

413 (DOE/IG–0327) **The remedial investigation/feasibility study process at Oak Ridge National Laboratory.** USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office. 1 Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

Report to The Secretary.

Martin Marietta Energy Systems, Inc. (Energy Systems), manages and operates the Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee, under a cost-plus-award-fee contract administered by the Department of Energy's (DOE) Oak Ridge Operations Office (Operations Office). Energy Systems' environmental restoration program is responsible for eliminating or reducing the risk posed by inactive and surplus sites and facilities that have been contaminated with radioactive, hazardous, or mixed wastes. The remedial investigation and feasibility study (RI/FS) is being conducted as part of Energy Systems' environmental restoration program. The objective of the audit was to determine if the proposed interim source control action identified in the "Proposed Plan for the Oak Ridge National Laboratory Waste Area Grouping 6 Interim Remedial Action" had been adequately justified. The audit disclosed that the proposed source control interim remedial action, three flexible membrane caps estimated to cost $140 million for waste area grouping 6, was not adequately justified. We recommended that DOE justify the proposed action before agreeing to proceed. The Manager, Oak Ridge Operations Office, generally concurred with the audit recommendations.

414 (DOE/OR–01-1115-D2) **Remedial investigation work plan for Bear Creek Valley Operable Unit 4 (shallow groundwater in Bear Creek Valley) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Jul 1993. 387p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (Y/ER–56-D2). Order Number DE94001950. Source: OSTI; NTIS; INIS; GPO Dep.

To effectively evaluate the cumulative impact of releases from multiple sources of contamination, a structured approach has been adopted for Oak Ridge Reservation (ORR) based on studies of the groundwater and surface water separate from studies of the sources. Based on the realization of the complexity of the hydrogeologic regime of the ORR, together with the fact that there are numerous sources contributing to groundwater contamination within a geographical area, it was agreed that more timely investigations, at perhaps less cost, could be achieved by separating the sources

of contamination from the groundwater and surface water for investigation and remediation. The result will be more immediate attention [Records of Decision (RODs) for interim measures or removal actions] for the source Operable Units (OUs) while longer-term remediation investigations continue for the hydrogeologic regimes, which are labeled as integrator OUs. This remedial investigation work plan contains summaries of geographical, historical, operational, geological, and hydrological information specific to the unit. Taking advantage of the historical data base and ongoing monitoring activities and applying the observational approach to focus data gathering activities will allow the feasibility study to evaluate all probable or likely alternatives.

415 (DOE/OR–01-1117/V1) **Oak Ridge Reservation Federal Facility Agreement quarterly report for the Environmental Restoration Program, Volume 1, October–December 1992.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Inc., Piketon, OH (United States). Jan 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;AC05-76OR00001. (ORNL/M–2591). Order Number DE94002243. Source: OSTI; NTIS; INIS; GPO Dep.

This quarterly progress report satisfies requirements for the Environmental Restoration (ER) Program which are specified in the Oak Ridge Reservation (ORR) Federal Facility Agreement (FFA) established between the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), and the Tennessee Department of Environment and Conservation (TDEC). The reporting period covered is October through December 1992(first quarter of FY 1993). Sections 1.1 and 1.2 provide respectively the milestones scheduled for completion during the reporting period and a list of documents that have been proposed for transmittal during the following quarter but have not been formally approved as FY 1993 commitments. This first section is followed by: significant accomplishments; technical status at Y-12 operable units, Oak Ridge National Laboratory, Oak Ridge K-25 site, Clinch River, Oak Ridge Associated Universities, and technical oversight and technical programs; and response action contractor assignments.

416 (DOE/OR–01-1168-D2) **Risk characterization data manual for Category D inactive liquid low-level waste tank systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** USDOE Oak Ridge Operations Office, TN (United States); Oak Ridge National Lab., TN (United States). Sep 1993. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER/Sub–90-LJ068/1-D2). Order Number DE94001658. Source: OSTI: NTIS; INIS; GPO Dep.

This manual reports the results of a risk characterization of Category D inactive liquid low-level radioactive waste (LLLW) underground storage tanks (Uses) at the Oak Ridge National Laboratory (ORNL). The risk characterization is required by the Federal Facility Agreement between the Department of Energy-Oak Ridge Operations Office, the Environmental Protection Agency-Region IV, and the Tennessee Department of Environment and Conservation. The intent of the risk characterization is to determine relative priorities for assessment and remediation. A total of 55 FFA Category D inactive LLLW tanks are discussed in this manual. Of the 39 tanks at ORNL that have been accepted into the Environmental Restoration (ER) Program, all have been sampled for preliminary characterization, except for 5 tanks that were found to be empty plus I that was found not to exist. The remaining 16 tanks are in the Waste Management (WM) Program. Twelve were sampled for preliminary characterization, and four were found empty. Each sampled tank was scored on a scale of I to 5 on the basis of three criteria: (1) leak characteristics, (2) location, and (3) toxicological characteristics of residual sludges and liquids. Each criterion was assigned a weighing factor based on perceived importance. The criterion score multiplied by the weighting factor equaled the tank's total score for that criterion. The three weighted criterion scores for each tank were then summed for a total score for that tank. When the scores for all tanks had been weighted and summed, the tanks were ranked in descending order on the basis of their total scores. The highest possible score for a tank is 30. The descending rank order represents the recommended priorities for evaluation: the higher the score, the higher the priority for evaluation. Of the 54 tanks sampled in the risk characterization, 23 tanks scored 16 or higher, 11 scored between 10 and 15, 5 scored between 4 and 9, and 15 scored 3 or less.

417 (DOE/OR/00033–T560) **Development of derived investigation levels for use in internal dosimetry at the West Valley Demonstration Project.** Johnson, P. (Pittsburgh Univ., PA (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Pittsburgh Univ., PA (United States). 1991. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94001402. Source: OSTI; NTIS; INIS; GPO Dep.

The objective was to determine if the routine internal dosimetry program at the West Valley Demonstration Project is capable of meeting the performance objective of 1 mSv annual effective dose equivalent due to internal contamination. With the use of the computer code REMedy the annual effective dose equivalent is calculated. Some of the radionuclides of concern result in an annual effective dose equivalent that exceeds the performance objective. Although the results exceed the performance objective, in all but two cases they do not exceed the US DOE regulatory limits. In these instances the Th-232 and Am-241 were determined to exceed the committed dose equivalent limit to their limiting tissue. In order to document the potential missed dose for regulatory compliance, Sr-90 is used as an indicator for Th-232. For Am-241 an investigation as to whether or not the minimum detectable amount can be lowered is performed. The derived investigation levels as a result of this project are 4.9E3 Bq/lung count for Co-60, 2.2E4 Bq/lung count for Cs-137, 1.9 Bq/1 for Sr-90 and for radionuclides other than Sr-90 any value greater than or equal to three standard deviations above their net count is considered to require further investigation.

418 (DOE/OR/21607–T6) **The potential human health effect(s) of the metal uranium in the environment: Report on the known human health effects associated with the exposure to the metal uranium.** Oak Ridge Research Inst., TN (United States). [1990]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21607. Order Number DE94000859. Source: OSTI; NTIS; GPO Dep.

Concern over the levels of the metal uranium in the environment as a result of industrial activities has been expressed by several Federal and State agencies. This concern is associated with potential human health effects of this metal on kidney function and bone formation. Although limits for the Metal uranium in the environment remain to be set, the Environmental Protection Agency (EPA) is currently in the process of establishing guidance limits for this metal in water and soil. These limits will be established for both the metal and the associated radioactivity. The suggested limits currently being considered for water and soil are, 20 pCi/liter and 10 pCi/gram wet weight, respectively. For naturally occurring uranium EPA assumes that 1 ug of uranium metal equals 0.67 pCi at equilibrium (i.e. at equilibrium the mass ratio of ^{234}uranium to ^{238}uranium is small but their activities are equal). Thus the limits for water and soil on weight basis for the uranium metal would be 30 ug/liter and 15 ug/gram wet weight, respectively. These limits are being established based on the potential increase in cancer death in populations that exceed this limit. Since there does not appear to be a significant correlation between cancer deaths and.uranium metal exposure (see discussion below), these limits will probably be established based on the known association between radionuclides exposure and cancer deaths. The exposure limits for other health effects such as kidney damage and retardation in bone formation apparently are not being considered by EPA.

419 (DOE/OR/21971–T2) **Site-specific earthquake response analysis for Portsmouth Gaseous Diffusion Plant, Portsmouth, Ohio: Final report.** Sykora, D.W.; Davis, J.J. Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). Geotechnical Lab. Aug 1993. 417p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-91OR21971. (GL–93-13). Order Number DE93041149. Source: OSTI; NTIS; INIS; GPO Dep.

A site-specific earthquake response study was conducted for the US Department of Energy (DOE) Portsmouth Gaseous Diffusion

Plant (PORTS), located near Portsmouth, Ohio, to provide guidance for the seismic safety analysis and future design of structures and facilities there. The methods used for this study generally follow widely-accepted and validated practices of the geotechnical earthquake engineering profession as documented in professional literature.

420 (DOE/RL–91-40) **Hanford past-practice strategy.** Thompson, K.M. USDOE Richland Operations Office, WA (United States). Nov 1991. 35p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93041114. Source: OSTI; NTIS; GPO Dep.

In May 1989, the US Environmental Protection Agency (EPA), the State of Washington Department of Ecology (Ecology) and the US Department of Energy (DOE) entered into an Interagency Agreement to provide a legal and procedural framework for cleanup and regulatory compliance at numerous hazardous waste sites at the Hanford Site. Four subareas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been included on the EPA's National Priorities List (NPL). Under the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), the more than 1,000 inactive waste disposal and unplanned release sites were originally grouped into 78 operable units (74 source operable units and 4 groundwater operable units, which underlie the source units). The contamination is in the form of solely hazardous waste, radioactive mixed waste, and other Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances. Included within the Tri-Party Agreement are 55 Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) facilities, which will be closed or permitted to operate in accordance with Washington Administrative Code (WAC) 173-303 (RCRA) regulations. The parties have undertaken an ongoing dialogue over the past year to develop a new strategy for streamlining the past-practice corrective action process. This strategy provides new concepts for (1) accelerating decision making by maximizing the use of existing data consistent with data quality objectives and (2) undertaking expedited response actions and/or interim remedial measures as appropriate to either remove threats to human health and welfare and the environment or to reduce risk by reducing toxicity, mobility, or volume of contaminants.

421 (DOE/RL–91-45-Rev.2) **Hanford Site baseline risk assessment methodology: Revision 2.** USDOE Richland Field Office, WA (United States). Mar 1993. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93016766. Source: OSTI; NTIS; INIS; GPO Dep.

This methodology has been developed to prepare human health and environmental evaluations of risk as part of the Comprehensive Environmental Response, Compensation, and Liability Act remedial investigations (RIs) and the Resource Conservation and Recovery Act facility investigations (FIs) performed at the Hanford Site pursuant to the Hanford Federal Facility Agreement and Consent Order referred to as the Tri-Party Agreement. Development of the methodology has been undertaken so that Hanford Site risk assessments are consistent with current regulations and guidance, while providing direction on flexible, ambiguous, or undefined aspects of the guidance. The methodology identifies Site-specific risk assessment considerations and integrates them with approaches for evaluating human and environmental risk that can be factored into the risk assessment program supporting the Hanford Site cleanup mission. Consequently, the methodology will enhance the preparation and review of individual risk assessments at the Hanford Site.

422 (DOE/RL–92-70-Vol.1) **Phase 1 remedial investigation report for 200-BP-1 operable unit: Volume 1.** USDOE Richland Operations Office, WA (United States). Sep 1993. 511p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000788. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Hanford Site, in Washington State is organized into numerically designated operational areas including the 100, 200, 300, 400, 600, and 1100 Areas. The US Environmental Protection Agency (EPA), in November 1989 included the 200 Areas of the Hanford Site on the National Priority List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Inclusion on the NPL initiated the remedial investigation (RD process for the 200-BP-1 operable unit. These efforts are being addressed through the Hanford Federal Facility Agreement and Consent Order (Ecology et al. 1989) which was negotiated and approved by the DOE, the EPA, and the State of Washington Department of Ecology (Ecology) in May 1989. This agreement, known as the Tri-Party Agreement, governs all CERCLA efforts at Hanford. In March of 1990, the Department of Energy, Richland Operations (DOE-RL) issued a Remedial Investigation/Feasibility Study (RI/FS) work plan (DOE-RL 1990a) for the 200-BP-1 operable unit. The work plan initiated the first phase of site characterization activities associated with the 200-BP-1 operable unit. The purpose of the 200-BP-1 operable unit RI is to gather and develop the necessary information to adequately understand the risks to human health and the environment posed by the site and to support the development and analysis of remedial alternatives during the FS. The RI analysis will, in turn, be used by Tri-Party Agreement signatories to make a risk-management-based selection of remedies for the releases of hazardous substances that have occurred from the 200-BP-1 operable unit.

423 (DOE/RL–93-27) **Treatability test plan for the 200-BP-1 prototype surface barrier.** USDOE Richland Operations Office, WA (United States). Jun 1993. 33p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93041112. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE), Hanford Site, in Washington State is organized into numerically designated operational areas including the 100, 200, 300, 400, 600, and 1100 Areas. The US Environmental Protection Agency (EPA), in November of 1989, included the 200 Areas of the Hanford Site on the National Priority List (NPL) under the Comprehensive Environmental Response, compensation, and Liability Act of 1980 (CERCLA). The 200 Area is divided into operable units based on waste disposal information, location, facility, type, and other characteristics. The 200-BP-1 operable unit is one specific site located within the 200 East Area. Inclusion on the NPL initiated the remedial investigation (RI) process for characterizing the nature and extent of contamination and assessing risks to human health and the environment at the 200-BP-1 operable unit. In March of 1990, a remedial investigation/feasibility study (RI/FS) work plan for the 200-BP-1 operable unit was issued (DOE-RL 1990a). The work plan outlined the first phase of site characterization activities, which were completed in March of 1993 with the issuance of Phase I Remedial Investigation Report for the 200-BP-1 Operable Unit (DOE-RL 1993, Draft A). Remedial action objectives outlined in the RI report suggest that a likely remedial action at the 200-BP-1 operable unit could involve the use of a surface barrier. To further evaluate this technology, additional performance and constructability data are needed to implement this remedial action. This test plan describes the general methodology for conducting a prototype barrier treatability study. The objectives of this treatability study are to determine overall performance and constructability data on an actual waste site in conjunction with the Hanford Site Barrier Development Program.

424 (DOE/RL–93-64) **Sodium dichromate expedited response action assessment.** USDOE Richland Operations Office, WA (United States). Sep 1993. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001695. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) recommended that the US Department of Energy (DOE) perform an expedited response action (ERA) for the Sodium Dichromate Barrel Disposal Landfill. The ERA lead regulatory agency is Ecology and EPA is the support agency. The ERA was categorized as non-time-critical, which required preparation of an engineering evaluation and cost analysis (EE/CA). The EE/CA was included in the ERA proposal. The EE/CA is a rapid, focused evaluation of available technologies using specific screening factors to assess feasibility, appropriateness, and cost. The ERA goal is to reduce the potential for any contaminant migration from the landfill to the soil column, groundwater, and Columbia River. Since the Sodium Dichromate Barrel Disposal Landfill is the only waste site within the operable unit, the removal action may be the final remediation of the 100-IU-4 Operable Unit.

This ERA process started in March 1992. The ERA proposal went through a parallel review process with Westinghouse Hanford Company (WHC), DOE Richland Operations (RL), EPA, Ecology, and a 30-day public comment period. Ecology and EPA issued an Action Agreement Memorandum in March 1993 (Appendix A). The memorandum directed excavation of all anomalies and disposal of the collected materials at the Hanford Site Central Landfill. Primary field activities were completed by the end of April 1993. Final waste disposal of a minor quantity of hazardous waste was completed in July 1993.

425 (ES/ER/TM–90) **Environmental Restoration Program pollution prevention checklist guide for the surveillance and maintenance project phase.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Sep 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001032. Source: OSTI; NTIS; INIS; GPO Dep.

DOE Order 5820.2 mandates that a surveillance and maintenance program be established in all shut-down facilities to ensure adequate containment of contamination, provide physical safety and security, and reduce potential public and environmental hazards. A key consideration in this process is the prevention of any waste to be generated from these activities. The purpose of this checklist guide is to assist the user with incorporating pollution prevention/waste minimization (PP/WM) in all Surveillance and Maintenance (S&M) phase projects of the Environmental Restoration (ER) Program. This guide will help users document their PP/WM activities for technology transfer and reporting requirements. Automated computer screens will be created from the checklist data to assist users with implementing and evaluating waste reduction. Users can then establish numerical performance measures to measure progress in planning, training, self-assessments, field implementation, documentation, and technology transfer. Cost savings result as users train and assess themselves and perform preliminary waste assessments.

426 (ES/ER/TM–91) **Environmental Restoration Program pollution prevention checklist guide for the facility characterization project phase.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Sep 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001034. Source: OSTI; NTIS; INIS; GPO Dep.

A facility characterization (FC) is conducted to determine the nature and extent contamination at a potential hazardous facility waste site. The information gathered during an FC includes (1) data on the volume and chemical nature of the waste, (2) information on the extent of contamination and the migration potential of the contaminants, (3) preliminary information on evaluation of alternative concepts that can or cannot be considered, and (4)supportive technical and cost data. For the purposes of identification, the following operational phases will be used for definition for this phase of the decommissioning and decontamination process (1) facility characterization before clean up, (2) characterization during clean up, (3) characterization of waste materials, and (4) site characterization after clean up. A key consideration in this process is the prevention of any waste to be generated from these characterization activities. The purpose of this checklist guide is to assist users with incorporating pollution prevention/waste minimization (PP/WM) in all FC phase projects of the Environmental Restoration (ER) Program. This guide will help users document PP/WM activities for technology transfer and reporting requirements. Automated computer screens will be created from the checklist data to assist users with implementing and evaluating waste reduction.

427 (ES/ER/TM–92) **Environmental restoration program pollution prevention checklist guide for the evaluation of alternatives project phase.** Oak Ridge National Lab., TN (United States). Sep 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001035. Source: OSTI; NTIS; INIS; GPO Dep.

Evaluation of alternative studies determine what decontamination and decommissioning (D&D) alternatives are presented to regulators for facility and site cleanup. A key consideration in this process is the waste to be generated. Minimizing the volume and toxicity of this waste will ultimately contribute to the selection of the best clean-up option. The purpose of this checklist guide is to assist the user with incorporating pollution prevention/waste minimization (PP/WM) in all Evaluation of Alternatives (EV) phase projects of the Environmental Restoration (ER) Program. This guide will assist users with documenting PP/WM activities for technology transfer and reporting requirements. Automated computer screens will be created from the checklist data to help users implement and evaluate waste reduction. Users can then establish numerical performance measures to measure progress in planning, training, self-assessments, field implementation, documentation, and technology transfer. Cost savings result as users train and assess themselves, eliminating expensive process waste assessments and audit teams.

428 (FEMP–2306) **The process of life-cycle cost analysis on the Fernald Environmental Management Project.** Chang, D.Y. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Estimating Services); Jacoboski, J.A.; Fisher, L.A.; Beirne, P.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 7 Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-931095–46: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002550. Source: OSTI; NTIS; INIS; GPO Dep.

The Estimating Service Department of the Fernald Environmental Restoration Management Corporation (FERMCO) is formalizing the process of life-cycle cost analysis (LCCA) for the Fernald Environmental Management Project (FEMP). The LCCA process is based on the concepts, principles, and guidelines described by applicable Department of Energy's (DOE) order, pertinent published literature, and the National Bureau of Standards handbook 135. LCC analyses will be performed following a ten-step process on the FEMP at the earliest possible decision point to support the selection of the least-cost alternatives for achieving the FERMCO mission.

429 (FEMP/SUB–064) **Sitewide soil and debris management program for a DOE site under remediation.** Harvey, B.F. (Parsons Environmental Services, Inc., Fairfield, OH (United States)). Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project; Parsons Environmental Services, Inc., Fairfield, OH (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-931095–45: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002557. Source: OSTI; NTIS; INIS; GPO Dep.

In 1986, the United States Department of Energy (DOE) and the United States Environmental Protection Agency (US EPA) entered into a Federal Facility Compliance Agreement (FFCA). The agreement included provisions to investigate and define the nature and extent of contamination and to determine the necessity for remediation at the Fernald Environmental Management Project (FEMP) near Cincinnati, Ohio. The agreement is also pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Uranium enrichment production activities at the facility ceased in 1989. The FEMP mission is now environmental clean-up and remediation under the management of the Fernald Environmental Restoration Management Corporation. This report describes objectives and activities of remediation efforts at FEMP.

430 (KY/ER–11) **Environmental Restoration Site-Specific Plan for the Paducah Gaseous Diffusion Plant, FY 93.** Oak Ridge National Lab., TN (United States); Paducah Gaseous Diffusion Plant, KY (United States); Portsmouth Gaseous Diffusion Plant, OH (United States). 15 Jan 1993. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001 ;AC05-84OR21400. Order Number DE94000599. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides an overview of the major Environmental Restoration (ER) concerns at Paducah Gaseous Diffusion Plant (PGDP). The identified solid waste management units at PGDP are listed. In the Department of Energy (DOE) Five Year Plan development process, one or more waste management units are addressed in a series of activity data sheets (ADSs) which identify

planned scope, schedule, and cost objectives that are representative of the current state of planned technical development for individual or multiple sites.

431 (ORNL–6762) **Removal of uranium from uranium-contaminated soils–Phase 1: Bench scale testing: Uranium in soils integrated demonstration.** Francis, C.W. Oak Ridge National Lab., TN (United States). Sep 1993. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001998. Source: OSTI; NTIS; INIS; GPO Dep.

To address the management of uranium-contaminated soils at Fernald and other DOE sites, the DOE Office of Technology Development formed the Uranium in Soils Integrated Demonstration (USID) program. The USID has five major tasks. These include the development and demonstration of technologies that are able to (1) characterize the uranium in soil, (2) decontaminate or remove uranium from the soil, (3) treat the soil and dispose of any waste, (4) establish performance assessments, and (5) meet necessary state and federal regulations. This report deals with soil decontamination or removal of uranium from contaminated soils. The report was compiled by the USID task group that addresses soil decontamination; includes data from projects under the management of four DOE facilities [Argonne National Laboratory (ANL), Los Alamos National Laboratory (LANL), Oak Ridge National Laboratory (ORNL), and the Savannah River Plant (SRP)]; and consists of four separate reports written by staff at these facilities. The fundamental goal of the soil decontamination task group has been the selective extraction/leaching or removal of uranium from soil faster, cheaper, and safer than current conventional technologies. The objective is to selectively remove uranium from soil without seriously degrading the soil's physicochemical characteristics or generating waste forms that are difficult to manage and/or dispose of. Emphasis in research was placed more strongly on chemical extraction techniques than physical extraction techniques.

432 (ORNL/ER–180) **Second annual report of the Environmental Restoration Monitoring and Assessment Program at Oak Ridge National Laboratory.** Clapp, R.B.; Watts, J.A. (eds.). Oak Ridge National Lab., TN (United States). Sep 1993. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001153. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division ESD Publication 4108.

This report summarizes the salient features of the annual efforts of environmental monitoring and field investigations conducted to support the Environmental Restoration (ER) Program at the Oak Ridge National Laboratory (ORNL). This report focuses on the watershed scale, striving to provide an ORNL site-wide perspective on types, distribution, and transport of contamination. Results are used to enhance the conceptual understanding of the key contaminants and the sources, fluxes, and processes affecting their distribution and movement. This report summarizes the efforts of the Waste Area Grouping (WAG) 2 and Site Investigations (SI) program. WAG 2 is the lower portion of the White Oak Creek (WOC) system which drains the major contaminated sites at ORNL and discharges to the Clinch River where public access is allowed. The remedial investigation for WAG 2 includes a long-term multimedia environmental monitoring effort that takes advantage of WAG 2's role as an integrator and conduit of contaminants from the ORNL site. This report also includes information from other site-specific remedial investigations and feasibility studies (RI/FS) for contaminated sites at ORNL and data from other ongoing monitoring programs conducted by other organizations [e.g., the National Pollutant Discharge Elimination System (NPDES) compliance monitoring conducted by the Environmental Surveillance and Protection Section]. This information is included to provide an integrated basis to support ER decision making. This report summarizes information gathered through early 1993. Annual data, such as annual discharges of contaminants, are reported for calendar year 1992.

433 (ORNL/TM–12257) **X-231B technology demonstration for in situ treatment of contaminated soil: Technology evaluation and screening.** Siegrist, R.L.; Morris, M.I.; Donaldson, T.L.; Palumbo, A.V.; Herbes, S.E.; Jenkins, R.A.; Morrissey, C.M.; Harris, M.T. Oak Ridge National Lab., TN (United States). Aug 1993. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002244. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 3820.

The Portsmouth Gaseous Diffusion Plant (Ports) is located approximately 70 miles south of Columbus in southern Ohio. Among the several waste management units on the facility, the X-231B unit consists of two adjacent oil biodegradation plots. The plots encompass ~ 0.8 acres and were reportedly used from 1976 to 1983 for the treatment and disposal of waste oils and degreasing solvents, some containing uranium-235 and technetium-99. The X-231B unit is a regulated solid waste management unit (SWMU) under the Resource Conservation and Recovery Act (RCRA). The X-231B unit is also a designated SWMU located within Quadrant I of the site as defined in an ongoing RCRA Facilities Investigation and Corrective Measures Study (RFI/CMS). Before implementing one or more Technology Demonstration Project must be completed. The principal goal of this project was to elect and successfully demonstrate one ore more technologies for effective treatment of the contaminated soils associated with the X-231B unit at PORTS. The project was divided into two major phases. Phase 1 involved a technology evaluation and screening process. The second phase (i.e., Phase 2) was to involve field demonstration, testing and evaluation of the technology(s) selected during Phase 1. This report presents the methods, results, and conclusions of the technology evaluation and screening portion of the project.

434 (ORNL/TM–12259) **X-231B technology demonstration for in situ treatment of contaminated soil: Laboratory evaluation of chemical oxidation using hydrogen peroxide.** Gates, D.D.; Siegrist, R.L. Oak Ridge National Lab., TN (United States). Sep 1993. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002321. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4106.

Treatability studies were conducted as part of a comprehensive research project initiated to demonstrate as well as evaluate in situ treatment technologies for volatile organic compounds (VOCs) and radioactive substances in wet, slowly permeable soils. The site of interest for this project was the X-231B Oil Biodegradation unit at the Portsmouth Gaseous Diffusion Plant, a US Department of Energy (DOE) facility in southern Ohio. This report describes the treatability studies that investigated the feasibility of the application of low-strength hydrogen peroxide (H_2O_2) solutions to treat trichloroethylene (TCE)-contaminated soil.

435 (ORNL/TM–12368) **Miscellaneous radioactive materials detected during uranium mill tailings surveys.** Wilson, M.J. Oak Ridge National Lab., TN (United States). Oct 1993. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94000731. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE) Office of Environmental Restoration and Waste Management directed the Oak Ridge National Laboratory Pollutant Assessments Group in the conduct of radiological surveys on properties in Monticello, Utah, associated with the Mendaciously millsite National Priority List site. During these surveys, various radioactive materials were detected that were unrelated to the Monticello millsite. The existence and descriptions of these materials were recorded in survey reports and are condensed in this report. The radioactive materials detected are either naturally occurring radioactive material, such as rock and mineral collections, uranium ore, and radioactive coal or manmade radioactive material consisting of tailings from other millsites, mining equipment, radium dials, mill building scraps, building materials, such as brick and cinderblock, and other miscellaneous sources. Awareness of the miscellaneous and naturally occurring material is essential to allow DOE to forecast the additional costs and schedule changes associated with remediation activities. Also, material that may pose a health hazard to the public should be revealed to other regulatory agencies for consideration.

436 (PNL–8620) **Characterization of phosphate/sulfate waste grout cores.** Martin, P.F.C.; Lokken, R.O. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 63p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001999. Source: OSTI; NTIS; INIS; GPO Dep.

As part of efforts to clean up federal production sites, the U.S. Department of Energy (DOE) is treating selected low-level liquid wastes by incorporating them into cementitious waste forms. At the Hanford Site, low-level radioactive liquid wastes will be mixed with a blend of Portland cement, fly ash, clays, and other ingredients in a continuous process at the Grout Treatment Facility (GTF). The resulting grout slurry will be pumped to lined, underground concrete vaults where the grout will harden, thereby immobilizing contaminants. Physical property measurements and American Nuclear Society (ANS) 16.1 leach tests have been completed on 45 samples obtained from five cores from the phosphate/sulfate waste (PSW) grout vault. A summary of the compressive strength, bulk density, and sonic velocity data is compared with data from other PSW grout samples. Results of moisture content, thermal conductivity, and the leaching of aluminium, calcium, sodium, sulfate, cobalt-60, and cesium-137 are given.

437 (PNL–8849) **Pacific Northwest Laboratory ALARA report for CY 1992.** Ceffalo, G.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001553. Source: OSTI; NTIS; GPO Dep.

This report provides summary results of the CY 1992 As Low As Reasonably Achievable (ALARA) Program at the Pacific Northwest Laboratory (PNL).(a) This report includes information regarding whole-body exposures to radiation, skin contaminations, and the nonradiological ALARA program.

438 (RFP–4726) **Seismic hazard analysis at Rocky Flats Plant.** McGuire, R.K. (Risk Engineering, Inc., Golden, CO (United States)). EG and G Rocky Flats, Inc., Golden, CO (United States); Risk Engineering, Inc., Golden, CO (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-9310102–22: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94000516. Source: OSTI; NTIS; GPO Dep.

A probabilistic seismic hazard analysis is being conducted for the DOE Rocky Flats Plant, Jefferson County, Colorado. This is part of the overall review of the seismic exposure to facilities being conducted by DOE. The study has four major elements. (1) The historical seismicity in Colorado is being reviewed and synthesized to estimate historical rates of earthquake activity in the region of the site. (2) The geologic and tectonic evidence in Colorado and along the Front Range is being reviewed to determine appropriate seismic zones, potentially active faults, and constraints on fault slip rates. (3) Earthquake ground motion equations are being derived based on seismological knowledge of the earth's crust. Site specific soil amplification factors are also being developed using on-site shear wave velocity measurements. (4) The probability of exceedence of various seismic ground motion levels is being calculated based on the inputs developed on tectonic sources, faults, ground motion, and soil amplification. Deterministic ground motion estimates are also being made. This study is a state-of-the-art analysis of seismic hazard. It incorporates uncertainties in the major aspects governing seismic hazard, and has a documented basis founded on solid data interpretations for the ranges of inputs used. The results will be a valid basis on which to evaluate plant structures, equipment, and components for seismic effects.

439 (RFP–4775) **In situ remediation of plutonium from glovebox exhaust ducts at the Department of Energy's Rocky Flats Plant.** Dugdale, J.S.; Humiston, T.J.; Omer, G.E. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-9308177–1: Environmental remediation conference, Augusta, GA (United States), 25-28 Aug 1993). Order Number DE94000517. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium and other miscellaneous hold-up materials have been accumulating in the glovebox exhaust ducts at the Rocky Flats Plant over the 40 years of weapons production at the site. The Duct Remediation Project was undertaken to assess the safety impacts of this material, and to remove it from the ductwork. The project necessitated the development of specialized tools, equipment and methods to remediate the material from continuously operating ventilation systems. Special engineered access locations were also required to provide access to the ductwork, and to ensure that safety and system operability were not degraded as a result of the remediation efforts. Operations personnel underwent significant training and development, and became an important asset to the success of the project. In total, the project succeeded in removing over 40 kilograms of plutonium-bearing material from one of the major weapons production buildings at the plant.

440 (RL-SEP–866) **Thorium processing nuclear safety review.** Clayton, E.D. (Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab.); Geier, R.G.; Leverett, M.C. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 1 Dec 1965. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000751. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A review of the nuclear safety aspects of a proposal to process about 150 to 250 tons of thorium containing about one kilogram U-233 per ton has been made. The review was made at the request of the Chemical Processing Department in whose Purex plant the thorium processing will be carried out. The review group finds that the proposed operation can be conducted with no more risk of criticality than attends the standard plutonium processing in Purex, provided the safeguards planned by the Department are carried out. The review group also has developed some suggestions by which the Chemical Processing Department could enhance its nuclear safety position in all its processing of fissionable materials. These suggestions take the form of hazards analysis procedure additions and formalization and interpretation of criteria. These suggestions are not meant to imply that present operations in CPD are unsafe, but rather that a continuation of the past trend of upgrading safety is desirable in order to cope with more complex, dynamic and potentially more hazardous future operations.

441 (SAND–92-2932) **Fire hazards analysis for the Center for National Security and Arms Control (CNSAC) Facility.** Klamerus, E.W. (Sandia National Labs., Albuquerque, NM (United States)); Ross, S.B. Sandia National Labs., Albuquerque, NM (United States). Jul 1993. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000549. Source: OSTI; NTIS; GPO Dep.

This Fire Hazards Analysis is sponsored by Plant Engineering and is prepared to support the Safety Assessment for the CNSAC Facility. This is a preliminary fire hazards analysis of a yet to be constructed facility and is based upon the current building design and the current understanding of the potential occupancy hazards. The governing occupancy for this building is personnel offices. The CNSAC facility will be dedicated primarily to two activities: (1) arms control and verification technology and (2) intelligence. This report supplements the Safety Assessment for the CNSAC facility and follows the guidance of DOE Memorandum EH-31.3 and meets the objectives of paragraph 4 of DOE Order 5480.7A, "Fire Protection." This analysis demonstrates that under "worst case" assumptions a fire in the CNSAC facility will result in consequences which are below DOE offsite guidelines for accident conditions. This report is based upon preliminary design information and any major changes to the building design may require additional analyses.

442 (SAND–93-1244C) **Field demonstration of technologies for delineating uranium contaminated soils.** Tidwell, V.C. (Sandia National Labs., Albuquerque, NM (United States)); Cunnane, J.C.; Schwing, J.; Lee, S.Y.; Perry, D.L.; Morris, D.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931095–31: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001829. Source: OSTI; NTIS; INIS; GPO Dep.

An Integrated Demonstration Program, hosted by the Fernald Environmental Restoration Management Corporation (FERMCO), has been established for investigating technologies applicable to

the characterization and remediation of soils contaminated with uranium. An important part of this effort is the evaluation of field screening tools capable of acquiring high resolution information on the distribution of uranium contamination in surface soils in a cost-and-time efficient manner. Consistent with this need, four field screening technologies have been demonstrated at two hazardous waste sites at the FERMCO. The four technologies tested are wide-area gamma spectroscopy, beta scintillation counting, laser ablation-inductively coupled plasma-atomic emission spectroscopy (LA-ICP-AES), and long-range alpha detection (LRAD). One of the important findings of this demonstration was just how difficult it is to compare data collected by means of multiple independent measurement techniques. Difficulties are attributed to differences in measurement scale, differences in the basic physics upon which the various measurement schemes are predicated, and differences in the general performance of detector instrumentation. It follows that optimal deployment of these techniques requires the development of an approach for accounting for the intrinsic differences noted above. As such, emphasis is given in this paper to the development of a methodology for integrating these techniques for use in site characterization programs as well as the development of a framework for interpreting the collected data. The methodology described here also has general application to other field-based screening technologies and soil sampling programs.

443 (SAND–93-1261C) **Direct probability mapping of contaminants.** Rautman, C.A. Sandia National Labs., Albuquerque, NM (United States). 17 Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931095–43: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002287. Source: OSTI; NTIS; INIS; GPO Dep.

Exhaustive characterization of a contaminated site is a physical and practical impossibility. Descriptions of the nature, extent, and level of contamination, as well as decisions regarding proposed remediation activities, must be made in a state of uncertainty based upon limited physical sampling. Geostatistical simulation provides powerful tools for investigating contaminant levels, and in particular, for identifying and using the spatial interrelationships among a set of isolated sample values. This additional information can be used to assess the likelihood of encountering contamination at unsampled locations and to evaluate the risk associated with decisions to remediate or not to remediate specific regions within a site. Past operation of the DOE Feed Materials Production Center has contaminated a site near Fernald, Ohio, with natural uranium. Soil geochemical data have been collected as part of the Uranium-in-Soils Integrated Demonstration Project. These data have been used to construct a number of stochastic images of potential contamination for parcels approximately the size of a selective remediation unit. Each such image accurately reflects the actual measured sample values, and reproduces the univariate statistics and spatial character of the extant data. Post-processing of a large number of these equally likely, statistically similar images produces maps directly showing the probability of exceeding specified levels of contamination. Evaluation of the geostatistical simulations can yield maps representing the expected magnitude of the contamination for various regions and other information that may be important in determining a suitable remediation process or in sizing equipment to accomplish the restoration.

444 (SAND–93-2214C) **Modeling the thermal and structural response of engineered systems to abnormal environments.** Skocypec, R.D.; Thomas, R.K.; Moya, J.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309215–6: Surety technology symposium, Chelyacinsk (Russian Federation), 28 Sep - 2 oct 1993). Order Number DE94000556. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories (SNL) is engaged actively in research to improve the ability to accurately predict the response of engineered systems to thermal and structural abnormal environments. Abnormal environments that will be addressed in this paper include: fire, impact, and puncture by probes and fragments, as well as a combination of all of the above. Historically, SNL has demonstrated the survivability of engineered systems to abnormal environments using a balanced approach between numerical simulation and testing. It is necessary to determine the response of engineered systems in two cases: (1) to satisfy regulatory specifications, and (2) to enable quantification of a probabilistic risk assessment (PRA). In a regulatory case, numerical simulation of system response is generally used to guide the system design such that the system will respond satisfactorily to the specified regulatory abnormal environment. Testing is conducted at the regulatory abnormal environment to ensure compliance.

445 (SAND–93-2215C) **Development and experimental validation of computational methods to simulate abnormal thermal and structural environments.** Moya, J.L.; Skocypec, R.D.; Thomas, R.K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309215–3: Surety technology symposium, Chelyacinsk (Russian Federation), 28 Sep - 2 oct 1993). Order Number DE94000554. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past 40 years, Sandia National Laboratories (SNL) has been actively engaged in research to improve the ability to accurately predict the response of engineered systems to abnormal thermal and structural environments. These engineered systems contain very hazardous materials. Assessing the degree of safety/risk afforded the public and environment by these engineered systems, therefore, is of upmost importance. The ability to accurately predict the response of these systems to accidents (to abnormal environments) is required to assess the degree of safety. Before the effect of the abnormal environment on these systems can be determined, it is necessary to ascertain the nature of the environment. Ascertaining the nature of the environment, in turn, requires the ability to physically characterize and numerically simulate the abnormal environment. Historically, SNL has demonstrated the level of safety provided by these engineered systems by either of two approaches: (1) a purely regulatory approach, or (2) by a Probabilistic Risk Assessment (PRA). This paper will address the latter of the two approaches.

446 (SAND–93-8012) **Nonstructural seismic restraint guidelines.** Butler, D.M.; Czapinski, R.H.; Firneno, M.J.; Feemster, H.C.; Fornaciari, N.R.; Hillaire, R.G.; Kinzel, R.L.; Kirk, D.; McMahon, T.T. Sandia National Labs., Livermore, CA (United States). Aug 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94001167. Source: OSTI; NTIS; GPO Dep.

The Nonstructural Seismic Restraint Guidelines provide general information about how to secure or restrain items (such as material, equipment, furniture, and tools) in order to prevent injury and property, environmental, or programmatic damage during or following an earthquake. All SNL sites may experience earthquakes of magnitude 6.0 or higher on the Richter scale. Therefore, these guidelines are written for all SNL sites.

447 (SR/H–624) **Project 8980, Savannah River Plant, 200 Area, 211-F, control house, radiation shielding.** Taber, B.L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 16 Aug 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94000607. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses the radiation shielding of the control house in the 200 Area.

448 (UCRL-JC–113773) **Optimal field-scale groundwater remediation using neural networks and the genetic algorithm.** Rogers, L.L.; Dowla, F.U.; Johnson, V.M. Lawrence Livermore National Lab., CA (United States). May 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306249–1: Computational technology initiative for the oil and gas industry, Los Alamos, NM (United States), 20-24 Jun 1993). Order Number DE93040499. Source: OSTI; NTIS; GPO Dep.

We present a new approach for field-scale nonlinear management of groundwater remediation. First, an artificial neural network (ANN) is trained to predict the outcome of a groundwater transport

simulation. Then a genetic algorithm (GA) searches through possible pumping realizations, evaluating the fitness of each with a prediction from the trained ANN. Traditional approaches rely on optimization algorithms requiring sequential calls of the groundwater transport simulation. Our approach processes the transport simulations in parallel and "recycles" the knowledge base of these simulations, greatly reducing the computational and real-time burden, often the primary impediment to developing field-scale management models. We present results from a Superfund site suggesting that such management techniques can reduce cleanup costs by over a hundred minion dollars.

449 (UCRL-JC–113790) **DOE capabilities for in-situ characterization and monitoring of formation properties in the vadose zone.** Hearst, J.R. (Lawrence Livermore National Lab., CA (United States)); Brodeur, J.R.; Koizumi, C.J.; Conaway, J.G.; Mikesell, J.L.; Nelson, P.H.; Stromswold, D.C.; Wilson, R.D. Lawrence Livermore National Lab., CA (United States). Sep 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931095–39: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002006. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Environmental Restoration (ER) Program faces the difficult task of characterizing the properties of the subsurface and identifying and mapping a large number of contaminants at landfills, surface disposal areas, spill sites, nuclear waste tanks, and subsurface contaminant plumes throughout the complex of DOE facilities. Geophysical borehole logs can measure formation properties such as bulk density, water content, and lithology, and can quantitatively analyze for radionuclides and such elements as chlorine and heavy metals. Since these measurements can be replaced as desired, they can be used for both initial characterization and monitoring of changes in contaminant concentration and water content (sometimes linked to contaminant migration), at a fraction of the cost of conventional sampling. The techniques develop at several DOE laboratories, and the experience that the authors have gained in making in-situ measurements in the vadose zones, are applicable to problems at many other DOE sites. Moreover, they can capitalize on existing inventories of boreholes. By building on this experience workers involved in ER projects at those sites should be able to obtain high-quality data at substantial reductions in cost and time.

450 (UCRL-LR–108991-Add.1) **Effects of non-latching blast valves on the source term and consequences of the design-basis accidents in the Device Assembly Facility (DAF).** Nguyen, D.H. Lawrence Livermore National Lab., CA (United States). Aug 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93040484. Source: OSTI; NTIS; INIS; GPO Dep.

The analysis of the Design-Basis Accidents (DBA) involving high explosives (HE) and Plutonium (Pu) in the assembly cell of the Device Assembly Facility (DAF), which was completed earlier, assumed latching blast valves in the ventilation system of the assembly cell. Latching valves effectively sealed a release path through the ventilation duct system. However, the blast valves in the assembly cell, as constructed are actually non-latching valves, and would reopen when the gas pressure drops to 0.5 psi above one atmosphere. Because the reopening of the blast valves provides an additional release path to the environment, and affects the material transport from the assembly cell to other DAF buildings, the DOE/NV DAF management has decided to support an additional analysis of the DAF's DBA to account for the effects of non-latching valves. Three cases were considered in the DAF's DBA, depending on the amount of HE and Pu involved, as follows: Case 1 – 423 #HE, 16 kg Pu; Case 2 – 150 #HE 10 kg Pu; Case 3 – 55 #HE 5 kg Pu. The results of the analysis with non-latching valves are summarized.

451 (UCRL-LR–112400-92-1) **Environmental restoration/ waste management-applied technology semiannual report, January–June 1992: Volume 1, No. 1.** Adamson, M.; Kline-Simon, K. (eds.). Lawrence Livermore National Lab., CA (United States). 1992. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93041099. Source: OSTI; NTIS; INIS; GPO Dep.

This is the first issue from the Lawrence Livermore National Laboratory of The Environmental Restoration/Waste Management-Applied Technology (ER/WM-AT) Semiannual Report, a continuation of the Advanced Processing Technology (APT) Semiannual Report. The name change reflects the consolidation of the APT Program with the Environmental Restoration and Waste Management Program to form the Environmental Restoration/Waste Management-Applied Technology (ER/WM-AT) Program. The Livermore site mirrors, on a small scale, many of the environmental and waste management problems of the DOE Complex. The six articles in this issue cover incineration- alternative technologies, process development for waste minimization, the proposed Mixed Waste Management Facility, dynamic underground stripping, electrical resistance tomography, and Raman spectroscopy for remote characterization of underground tanks.

452 (WHC-EP–0619-Vol.3) **Risk management study for the retired Hanford Site facilities: Qualitative risk evaluation for the retired Hanford Site facilities: Volume 3.** Coles, G.A.; Shultz, M.V.; Taylor, W.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 751p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001230. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a risk evaluation of the 100 and 200 Area retired, surplus facilities on the Hanford Site. Also included are the related data that were compiled by the risk evaluation team during investigations performed on the facilities. Results are the product of a major effort performed in fiscal year 1993 to produce qualitative information that characterizes certain risks associated with these facilities. The retired facilities investigated for this evaluation are located in the 100 and 200 Areas of the 1,450-km^2 (570-mi^2) Hanford Site. The Hanford Site is a semiarid tract of land in southeastern Washington State. The nearest population center is Richland, Washington, (population 32,000) 30-km (20 mi) southeast of the 200 Area. During walkdown investigations of these facilities, data on real and potential hazards that threatened human health or safety or created potential environmental release issues were identified by the risk evaluation team. Using these findings, the team categorized the identified hazards by facility and evaluated the risk associated with each hazard. The factors contributing to each risk, and the consequence and likelihood of harm associated with each hazard also are included in this evaluation.

453 (WHC-EP–0684) **Surface stabilization and revegetation test plots: Fiscal year 1993 status report.** Sackschewsky, M.R.; Kemp, C.J.; Hayward, W.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001238. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company Decommissioning and Decontamination Engineering Group and Environmental Technology and Assessment Groups are developing new technologies to improve revegetation techniques for interim stabilization control over underground waste sites within the Radiation Area Remedial Action Program. Successful revegetation is an integral aspect of waste isolation strategy. Unfortunately, revegetation can be very difficult to achieve on the Hanford Site due to several factors: low annual precipitation, unpredictable timing of precipitation, low fertility of available soils, and coarse physical texture of soils covering waste sites. The tests in this report were performed during fiscal years 1992 and 1993 and include the use of two soil sealants in combination with bare soil and a soil/compost mixture and a comparison of a wheatgrass mixture and a native seed mixture. Hydroprobe access ports were placed in one-half of the test plots and moisture data was collected. Soil fertility and plant community characteristics were monitored during the two years of the test. During the first year all sites with compost provided additional fertility and retained greater amounts of soil moisture than noncomposted sites. The use of Enduraseal soil fixative provided greater soil moisture than the use of Aerospray-77 soil fixative. During the second year the use of compost and soil fixative's had a lesser effect on soil moisture. During late summer periods all treatments had very similar

soil moisture profiles. The use of compost greatly increased vegetative cover and soil fertility in comparison to sites that had no compost added. Testing of the seed mixtures found that Siberian wheatgrass and Sandberg's bluegrass were the most dominant of the seeded species observed. All plots exhibited a dominant plant cover of volunteer cheatgrass. Biomass production was significantly greater on plots with compost than on the noncomposted plots.

454 (WHC-EP–0688) **Fixation of soil surface contamination using natural polysaccharides.** Sackschewsky, M.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001225. Source: OSTI; NTIS; INIS; GPO Dep.

Natural polysaccharides were evaluated as alternatives to commercially available dust-control agents for application in buried-waste and contaminated-soil remediation situations. Materials were identified and evaluated with specific criteria in mind: the materials must be environmentally benign and must not introduce any additional hazardous materials; they must be effective for at least 2 or 3 days, but they do not necessarily have to be effective for more than 2 to 3 weeks; they should be relatively resistant to light traffic; they must not interfere with subsequent soil treatment techniques, especially soil washing; and they must be relatively inexpensive. Two products, a pregelled potato starch and a mixture of carbohydrates derived from sugar beets, were selected for evaluation. Testing included small- and large-scale field demonstrations, laboratory physical property analyses, and wind-tunnel evaluations.

455 (WHC-MR–0270) **200-BP-5 operable unit Technical Baseline report.** Jacques, I.D.; Kent, S.K. Westinghouse Hanford Co., Richland, WA (United States). Oct 1991. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002477. Source: OSTI; NTIS; INIS; GPO Dep.

This report supports development of a remedial investigation/feasibility study work plan for the 200-BP-5 operable unit. The report summarizes baseline information for waste sites and unplanned release sites located in the 200-BP-5 operable unit. The sites were investigated by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Company (Westinghouse Hanford). The investigation consisted of review and evaluation of current and historical Hanford Site reports, drawings, and photographs, and was supplemented with recent inspections of the Hanford Site and employee interviews. No field investigations or sampling were conducted.

456 (WHC-SA–1997) **Hazard characterization and special considerations for environmental and decontamination and decommissioning activities.** Kerr, N.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310163–1: Environmental restoration and decontamination and decommissioning activities and energy facility contractors workshop, Albuquerque, NM (United States), 5-6 Oct 1993). Order Number DE93040370. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the US Department of Energy (DOE) has changed from defense production of special nuclear materials to cleanup of production facilities at the Hanford Site. The DOE contractors have formed the Energy Facility Contractors Group to support this change in mission. In addition, the Safety Analysis Working Subgroup for Environmental Restoration and Decontamination and Decommissioning (ER/D&D) was formed to identify, develop, and share information that supports safety analyses and engineering of ER/D&D activities. Safety analysis is in part the process of identifying and understanding the hazards that could result in exposures to radiological or chemical hazardous substances. The following paragraphs address the special considerations given to hazard characterization for ER/D&D activities.

457 (WHC-SA–2018) **Interpretation of Ground Penetrating Radar data at the Hanford Site, Richland, Washington.** Bergstrom, K.A.; Mitchell, T.H.; Kunk, J.R. Westinghouse Hanford Co., Richland, WA (United States). Jul 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310160–1: Advanced ground penetrating radar: technologies and applications, Columbus, OH (United States), 26-28 Oct 1993). Order Number DE93040409. Source: OSTI; NTIS; INIS; GPO Dep.

Ground Penetrating Radar (GPR) is being used extensively during characterization and remediation of chemical and radioactive waste sites at the Hanford Site in Washington State. Time and money for GPR investigations are often not included during the planning and budgeting phase. Therefore GPR investigations must be inexpensive and quick to minimize impact on already established budgets and schedules. An approach to survey design, data collection, and interpretation has been developed which emphasizes speed and budget with minimal impact on the integrity of the interpretation or quality of the data. The following simple rules of thumb can be applied: (1) Assemble as much pre-survey information as possible, (2) Clearly define survey objectives prior to designing the survey and determine which combination of geophysical methods will best meet the objectives, (3) Continuously communicate with the client, before, during and after the investigation, (4) Only experienced GPR interpreters should acquire the field data, (5) Use real-time monitoring of the data to determine where and how much data to collect and assist in the interpretation, (6) Always "error" in favor of collecting too much data, (7) Surveys should have closely spaced (preferably 5 feet, no more than 10 feet), orthogonal profiles, (8) When possible, pull the antenna by hand.

458 (WHC-SA–2056) **Status of remedial investigation activities in the Hanford Site 300 Area groundwater operable unit.** Hulstrom, L.C.; Innis, B.E.; Frank, M.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–33: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001690. Source: OSTI; NTIS; INIS; GPO Dep.

The Phase 1 remedial investigation (RI) and Phase 1 and 2 feasibility studies (FS) for the 300-FF-5 groundwater operable unit underlying the 300 Area on the Hanford Site have been completed. Analysis and evaluation of soil, sediment, and surface water, and biotic sampling data, groundwater chemistry, and radiological data gathered over the past 3 years has been completed. Risk assessment calculations have been performed. Use of the data gathered, coupled with information from an automated water level data collection system, has enabled engineers to track three plumes that represent the most significant contamination of the groundwater.

459 (WHC-SA–2057) **Cost benefit analysis of remediation alternatives for controlling the flux of strontium-90 into the Columbia River.** Gustafson, F.W. (Westinghouse Hanford Co., Richland, WA (United States)); Todd, M.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–30: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001696. Source: OSTI; NTIS; INIS; GPO Dep.

The release of large volumes of water to waste disposal cribs at the Hanford Site's 100-N Area caused contaminants, principally strontium-90, to be carried toward the Columbia River through the groundwater. Since shutdown of the N Reactor, these releases have been discontinued, although small water flows continue to be discharged to the 1325-N crib. Most of the contamination which is now transported to the river is occurring as a result of the natural groundwater movement. The contaminated groundwater at N Springs flows into the river through seeps and springs along the river's edge. An expedited response action (ERA) has been proposed to eliminate or restrict the flux of strontium-90 into the river. A cost benefit analysis of potential remedial alternatives was completed that recommends the alternative which best meets given selection criteria prescribed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The methodology used for evaluation, cost analysis, and alternative recommendation is the engineering evaluation/cost analysis (EE/

CA). Complete remediation of the contaminated groundwater beneath 100-N Area was not a principal objective of the analysis. The objective of the cost benefit analysis was to identify a remedial alternative that optimizes the degree of benefit produced for the costs incurred.

460 (WHC-SA–2058) **Characterization and remediation of highly radioactive contaminated soil at Hanford.** Buckmaster, M.A. (Westinghouse Hanford Co., Richland, WA (United States)); Erickson, J.K. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–22: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001689. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site, Richland, Washington, contains over 1,500 identified waste sites and numerous groundwater plumes that will be characterized and remediated over the next 30 years. As a result of the Hanford Federal Facility Agreement and Consent Order, the US Department of Energy (DOE) has initiated a remedial investigation/feasibility study (RI/FS) at the 200-BP-1 operable unit. The 200-BP-1 RI/FS is the first Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigation on the Hanford Site that involves highly radioactive and chemically contaminated soils. The initial phase of site characterization was designed to assess the nature and extent of contamination associated with the source waste sites within the 200-BP-1 operable unit. Characterization activities consisted of drilling and sampling, chemical and physical analysis of samples, and development of a conceptual vadose zone model. These data were then used. to develop remedial alternatives during the FS evaluation. The preferred alternative resulting from the RI/FS process for the 200-BP-1 operable unit is to construct a surface isolation barrier. The multilayered earthen barrier will be designed to prevent migration of contaminants resulting from water infiltration, biointrusion, and wind and water erosion.

461 (WHC-SA–2061) **Planning a site investigation using analogous groups.** Pak, P.M. (USDOE Richland Operations Office, WA (United States)); Galgoul, M.J.; Wittreich, C.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–35: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001687. Source: OSTI; NTIS; INIS; GPO Dep.

A limited field investigation (LFI) has been designed for the 200-UP-2 Operable Unit within the 200 Areas of the US Department of Energy (DOE) Hanford Site in Washington state using the concept of analogous groups. The LFI is part of a RCRA facility investigation (RFI) corrective measures study (CMS) being conducted in this operable unit. The concept emphasizes that characterization activities can be reduced by identifying select sites (analogous sites) for characterization that represents a group of sites (analogous groups). This concept is particularly applicable to operable units that contain several waste management units that are similar in design, disposal history, and geology. Application of this concept reduced the number of waste management units initially undergoing characterization by more than two-thirds. The work plan is presently in the approval cycle with the field characterization phase expected to begin August 1993.

462 (WHC-SD-EN-AP–134) **Site characterization plan for the W-058 Project.** Rowley, C.A. Westinghouse Hanford Co., Richland, WA (United States). [1993]. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93040403. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this preoperational study plan is to characterize the proposed pipeline route for the Cross-Site Transfer System (W-058). The purpose of this study is to meet the requirements set forth in US Department of Energy (DOE) Order 5400.1, Chapter 4, (DOE 1990). The W-058 pipeline is intended to replace the existing Cross-Site Transfer System (H-2-43056). The proposed route for the W-058 project will be reviewed to provide information on documented waste sites and potentially to identify any undocumented hazards that may currently exist along the proposed route. Historical records will be researched for pertinent information. Health Physics personnel will perform a "walk-down" radiological survey of the proposed path. A sampling plan will be generated and will consist of actual drilling of boreholes to allow field screening for radionuclides and/or chemical contamination and the collection of samples at selected sites for laboratory analyses. The information generated from this combined effort will establish existing/potential contamination levels, aid in developing personnel safety requirements, assist in determining the need for any changes in the proposed route prior to installation/construction of the new pipeline, and satisfy the requirements of a preoperational baseline for the project.

463 (WHC-SD-EN-AP–140) **Remediation plan for Well 399-1-16C.** Hulstrom, L.C. Westinghouse Hanford Co., Richland, WA (United States). 25 Jun 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002478. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to determine hydraulic conditions at Well 399-1-16C (16C) and to present a remediation plan. The objectives are to restore hydraulic isolation of the confined aquifer (water level returning to approximately 370 ft) and to prevent chemical contamination between the unconfined and confined aquifers. This work scope is an extension of Task 4d of the Remedial Investigation/Feasibility Study Work Plan for the 300-FF-5 Operable Unit, Hanford Site, Richland, Washington, DOE/RL 89-14 (1990), and is a result of discussions held with the regulators and documented this plan was presented to the regulators at the January 1993 unit managers meeting and is documented in the minutes from that meeting.

464 (WHC-SD-EN-TI–181) **100-D Area technical baseline report.** Carpenter, R.W. Westinghouse Hanford Co., Richland, WA (United States). 20 Aug 1993. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041107. Source: OSTI; NTIS; INIS; GPO Dep.

This document is prepared in support of the 100 Area Environmental Restoration activity at the US Department of Energy's Hanford Site near Richland, Washington. It provides a technical baseline of waste sites located at the 100-D Area. The report is based on an environmental investigation undertaken by the Westinghouse Hanford Company (WHC) History Office in support of the Environmental Restoration Engineering Function and on review and evaluation of numerous Hanford Site current and historical reports, drawings, and photographs, supplemented by site inspections and employee interviews. No intrusive field investigation or sampling was conducted. All Hanford coordinate locations are approximate locations taken from several different maps and drawings of the 100-D Area. Every effort was made to derive coordinate locations for the center of each facility or waste site, except where noted, using standard measuring devices. Units of measure are shown as they appear in reference documents. The 100-D Area is made up of three operable units: 100-DR-1, 100-DR-2, and 100-DR-3. All three are addressed in this report. These operable units include liquid and solid waste disposal sites in the vicinity of, and related to, the 100-D and 100-DR Reactors. A fourth operable unit, 100-HR-3, is concerned with groundwater and is not addressed here. This report describes waste sites which include cribs, trenches, pits, french drains, retention basins, solid waste burial grounds, septic tanks, and drain fields. Each waste site is described separately and photographs are provided where available. A complete list of photographs can be found in Appendix A. A comprehensive environmental summary is not provided here but may be found in Hanford Site National Environmental Policy Act Characterization (Cushing 1988), which describes the geology and soils, meteorology, hydrology, land use, population, and air quality of the area.

465 (WHC-SD-EN-TI–202) **FY 93 site characterization status report and data package for the carbon tetrachloride site.** Rohay, V.J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States). 28 Sep 1993. 366p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001700. Source: OSTI; NTIS; GPO Dep.

This report provides the status and accomplishments from fiscal year site characterization activities conducted as part of the 200 West Area Carbon Tetrachloride Expedited Response Action and the Volatile Organic Compounds - Arid Integrated Demonstration. The report includes or references all available raw data collected as part of these tasks. During fiscal year 1993, the 200 West Area Carbon Tetrachloride Expedited Response Action and the Volatile Organic Compounds - Arid Integrated Demonstration programs focused on the carbon tetrachloride plume in the unsaturated zone underlying the 200 West Area at the Hanford Site in southeast Washington.

466 (WHC-SD-EN-TP–035) **Tracer gas diffusion sampling test plan.** Rohay, V.J. Westinghouse Hanford Co., Richland, WA (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001697. Source: OSTI; NTIS; INIS; GPO Dep.

Efforts are under way to employ active and passive vapor extraction to remove carbon tetrachloride from the soil in the 200 West Area an the Hanford Site as part of the 200 West Area Carbon Tetrachloride Expedited Response Action. In the active approach, a vacuum is applied to a well, which causes soil gas surrounding the well to be drawn up to the surface. The contaminated air is cleaned by passage through a granular activated carbon bed. There are questions concerning the radius of influence associated with application of the vacuum system and related uncertainties about the soil-gas diffusion rates with and without the vacuum system present. To address these questions, a series of tracer gas diffusion sampling tests is proposed in which an inert, nontoxic tracer gas, sulfur hexafluoride (SF_6), will be injected into a well, and the rates of SF_6 diffusion through the surrounding soil horizon will be measured by sampling in nearby wells. Tracer gas tests will be conducted at sites very near the active vacuum extraction system and also at sites beyond the radius of influence of the active vacuum system. In the passive vapor extraction approach, barometric pressure fluctuations cause soil gas to be drawn to the surface through the well. At the passive sites, the effects of barometric "pumping" due to changes in atmospheric pressure will be investigated. Application of tracer gas testing to both the active and passive vapor extraction methods is described in the wellfield enhancement work plan (Rohay and Cameron 1993).

467 (WINCO–1134) **Evaluation of the INEL passive cryogenic whole air sampler.** McManus, G.J.; Hohorst, F.A.; Bird, S.K.; Motes, B.G.; Fernandez, S.J. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000716. Source: OSTI; NTIS; GPO Dep.

This report documents the results of an evaluation of a portable, passive cryogenic sampler designed for the collection of whole air samples without loss or concentration of any atmospheric constituents. The design criteria included: (a) sample volume capacity greater than 100 liters STP; (b) no concentration or loss of atmospheric constituents; (c) no vertical dimension greater than 50 cm or horizontal dimension greater than 15 cm; (d) operation without electrical power; (e)sampling lifetime greater than two hours; (f) total gross weight less than 20 kg; (g) resistance to undetected tampering. The sampler described in this report has been found to meet or exceed the design criteria once safety-related add-ons (rotameter, pressure relief valves, and base-plate) are either removed or redesigned for a smaller profile.

468 (WINCO–11955) **Passive Cryogenic Sampler.** Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-9305290–1: 1993 industry technology, Kansas City, MO (United States), 5-8 May 1993). Order Number DE94000918. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling is the key step in any analysis regime. Gaseous systems only magnify the critical nature of the sampling step. The Passive Cryogenic Gas Sampler provides a proven, cost-effective way to obtain high-quality samples. This report specifies some advantages and design specifications of the Passive Cryogenic Gas Sampler.

469 (WSRC-MS–93-224) **An integration strategy for the NEPA and RCRA/CERCLA programs at the Savannah River Site.** Shedrow, C.B.; Gaughan, B.W.; Moore-Shedrow, D.B. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–10: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001186. Source: OSTI; NTIS; INIS; GPO Dep.

Savannah River Site (SRS) environmental remediation activities are conducted according to applicable environmental laws and regulations, including the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Environmental Policy Act (NEPA). Waste unit cleanups are accomplished by evaluating RCRA and CERCLA requirements at the sites, then selecting and implementing the appropriate cleanup measures. All State and Federal regulations, including the NEPA, are considered for applicability to each waste site. This strategy is discussed.

470 (WSRC-MS–93-454) **Savannah River Site (SRS) implementation program plan for DNFSB Recommendation 90-2.** Talukdar, B.K.; Loceff, F. Westinghouse Savannah River Co., Aiken, SC (United States). 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9310102–28: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94001749. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) based on its review and evaluation of the content and implementation of standards relating to design, construction, operation, and decommissioning of Defense Nuclear Facilities has made the recommendations (90-2) which when implemented would assure comparable or equivalent levels of safety to the environment, public and workers as required for the commercial nuclear facilities. DOE has accepted the DNFSB 90-2 recommendations and have directed SRS and other M&Os to implement them. This report discusses implementation program which commits to developing Requirement Identification Documents (RID's) for all defense nuclear facilities in the DOE complex.

471 (WSRC-MS–93-481) **Savannah River Site environmental restoration lessons learned program.** Plunkett, R.A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Leibfarth, E.C.; Treger, T.M.; Blackmon, A.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–26: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001814. Source: OSTI; NTIS; INIS; GPO Dep.

For the past three years environmental restoration has been formally consolidated at Savannah River Site. Accomplishments include waste site investigations to closure activities. Positive, as well as negatively impacting, events have occurred. Until recently, lessons learned were captured on a less than formal basis. Now, a program based upon critiques, evaluations and corrective actions is being used. This presentation reviews the development, implementation and use of that program.

472 (WSRC-RP–92-824-Rev.1) **Treatability studies on F/H Area "hot spot" groundwater composite: Revision 1.** Bibler, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Aug 1993. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94002029. Source: OSTI; NTIS; GPO Dep.

The data found in this report were collected from laboratory experiments that were conducted to characterize the "hot spot" groundwater before and after pH adjustment, to describe the settling behavior and particle size of the precipitates resulting from pH adjustment, and to compare several methods of pH adjustment. Although Decontamination Factors (DFs) for all precipitating agents are similar, the best settling characteristics and most manageable precipitate were produced when 25 ppM Al^{3+} was introduced as $Al_2(SO_4)_3$ and pH adjustment was made from 6–8 with NaOH. The resulting precipitate will not be a hazardous secondary waste.

473 (Y/SUB–92-YP507C/3/P1) **Groundwater quality assessment for the Chestnut Ridge Hydrogeologic Regime at the Y-12 Plant: 1991 groundwater quality data and calculated rate of contaminant migration.** Oak Ridge Y-12 Plant, TN (United States); HSW Environmental Consultants, Inc., Oak Ridge, TN (United States). Feb 1992. 433p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94002583. Source: OSTI; NTIS; GPO Dep.

This report contains groundwater quality data obtained during the 1991 calendar year at several hazardous and non-hazardous waste- management facilities associated with the US Department of Energy (DOE) Y-12 Plant (Figure 1). These sites are located south of the Y-12 Plant in the Chestnut Ridge Hydrogeologic Regime (CRHR), which is one of the three regimes defined for the purposes of groundwater quality monitoring and remediation (Figure 2). The Health, Safety, Environment, and Accountability (HSEA) Division of the Y-12 Plant Environmental Management Department manages the groundwater monitoring activities in each regime as part of the Y-12 Plant Groundwater Protection Program (GWPP).

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Refer also to citation(s) 279, 1872

474 (CONF-930749–73) **Passive sensor systems for nuclear material monitoring.** Simpson, M.L.; Boatner, L.A.; Holcomb, D.E.; McElhaney, S.A.; Mihalczo, J.T.; Muhs, J.D.; Roberts, M.R.; Hill, N.W. Oak Ridge National Lab., TN (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 34. annual meeting of the Institute of Nuclear Materials Management; Scottsdale, AZ (United States); 18-21 Jul 1993. Order Number DE94000332. Source: OSTI; NTIS; INIS; GPO Dep.

Passive fiber optic sensor systems capable of confirming the presence of special nuclear materials in storage or process facilities are being developed at Oak Ridge National Laboratory (ORNL). These sensors provide completely passive, remote measurement capability. No power supplies, amplifiers, or other active components that could degrade system reliability are required at the sensor location. ORNL, through its research programs in scintillator materials, has developed a variety of materials for use in alpha-, beta-, gamma-, and neutron-sensitive scintillator detectors. In addition to sensors for measuring radiation flux, new sensor materials have been developed which are capable of measuring weight, temperature, and source location. An example of a passive sensor for temperature measurement is the combination of a thermophosphor (e.g., rare-earth activated Y_2O_3) with ^6LiF (95% ^6Li). This combination results in a new class of scintillators for thermal neutrons that absorb energy from the radiation particles and remit the energy as a light pulse, the decay rate of which, over a specified temperature range, is temperature dependent. Other passive sensors being developed include pressure-sensitive triboluminescent materials, weight-sensitive silicone rubber fibers, scintillating fibers, and other materials for gamma and neutron detection. The light from the scintillator materials of each sensor would be sent through optical fibers to a monitoring station, where the attribute quantity could be measured and compared with previously recorded emission levels. Confirmatory measurement applications of these technologies are being evaluated to reduce the effort, costs, and employee exposures associated with inventorying stockpiles of highly enriched uranium at the Oak Ridge Y-12 Plant.

475 (HW–45511) **Waste limits.** Hanford Works, Richland, WA (United States). 26 Sep 1956. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001625. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report contains tabulations of the approved waste limits for Hanford plants. These data are to be used in making allowable waste calculations.

476 (LA–12627-MS) **Measurement and analysis of neutron energy spectra from fission sources.** Byrd, R.C.; Auchampaugh, G.F.; Feldman, W.C. Los Alamos National Lab., NM (United States). Nov 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002434. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Measurements of neutron energy spectra are usually much more difficult than spectral measurements for other types of radiation. Because neutrons are uncharged, they can be detected only by nuclear interactions, either neutron capture or neutron scattering, neither of which provides am efficient method for spectroscopy at fission energies. A new scintillator technology combines the scattering and capture approaches to provide an electronically "black" detector, one that registers energy deposition only for neutrons that are totally absorbed. Using a prototype of such an instrument, the authors obtained spectral measurements for several fission sources at distances up to 11 m. Examples from these measurements serve to explain the detection principle, the instrument calibration, and the techniques for data analysis. A companion paper describes techniques for obtaining directional measurements, and subsequent papers will focus on particular features of the individual spectra and discuss comparisons with calculations.

477 (LA-UR–93-2609) **STAR: Software Toolkit for Analysis Research.** Doak, J.E. (Los Alamos National Lab., NM (United States)); Prommel, J.M.; Whiteson, R.; Hoffbauer, B.L.; Thomas, T.R.; Helman, P. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930749–57: 34. annual meeting of the Institute of Nuclear Materials Management, Scottsdale, AZ (United States), 18-21 Jul 1993). Order Number DE93018539. Source: OSTI; NTIS; INIS; GPO Dep.

Analyzing vast quantities of data from diverse information sources is an increasingly important element for nonproliferation and arms control analysis. Much of the work in this area has used human analysts to assimilate, integrate, and interpret complex information gathered from various sources. With the advent of fast computers, we now have the capability to automate this process thereby shifting this burden away from humans. In addition, there now exist huge data storage capabilities which have made it possible to formulate large integrated databases comprising many thereabouts of information spanning a variety of subjects. We are currently designing a Software Toolkit for Analysis Research (STAR) to address these issues. The goal of STAR is to Produce a research tool that facilitates the development and interchange of algorithms for locating phenomena of interest to nonproliferation and arms control experts. One major component deals with the preparation of information. The ability to manage and effectively transform raw data into a meaningful form is a prerequisite for analysis by any methodology. The relevant information to be analyzed can be either unstructured text structured data, signals, or images. Text can be numerical and/or character, stored in raw data files, databases, streams of bytes, or compressed into bits in formats ranging from fixed, to character-delimited, to a count followed by content The data can be analyzed in real-time or batch mode. Once the data are preprocessed, different analysis techniques can be applied. Some are built using expert knowledge. Others are trained using data collected over a period of time. Currently, we are considering three classes of analyzers for use in our software toolkit: (1) traditional machine learning techniques, (2) the purely statistical system, and (3) expert systems.

478 (LA-UR–93-2972) **Integrated neutron/gamma-ray portal monitors for nuclear safeguards.** Fehlau, P.E. Los Alamos National Lab., NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931107–5: Nuclear science symposium, San Francisco, CA (United States), 2-5 Nov 1993). Order Number DE93040123. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation monitoring is one nuclear-safeguards measure used to protect against the theft of special nuclear materials (SNM) by pedestrians departing from SNM access areas. The integrated neutron/gamma-ray portal monitor is an ideal radiation monitor for the task when the SNM is plutonium. It achieves high sensitivity for detecting both bare and shielded plutonium by combining two types of radiation detector. One type is a neutron-chamber detector,

comprising a large, hollow, neutron moderator that contains a single thermal-neutron proportional counter. The entrance wall of each chamber is thin to admit slow neutrons from plutonium contained in a moderating shield, while the other walls are thick to moderate fast neutrons from bare or lead-shielded plutonium so that they can be detected. The other type of detector is a plastic scintillator that is primarily for detecting gamma rays from small amounts of unshielded plutonium. The two types of detector are easily integrated by making scintillators part of the thick back wall of each neutron chamber or by inserting them into each chamber void. We compared the influence of the two methods of integration on detecting neutrons and gamma rays, and we examined the effectiveness of other design factors and the methods for signal detection as well.

479 (PNL–8864) **Evaluation of uranium transitions for isotopically-selective laser induced fluorescence with diode lasers (Technical Report for ST064).** Cannon, B.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94002000. Source: OSTI; NTIS; GPO Dep.

Isotopically-selective excitation of uranium atoms by diode lasers can be the basis for a portable instrument to perform uranium isotopic assays in the field. Such an instrument would improve the ability of on-site inspections to detect and deter nuclear proliferation. Published and unpublished spectroscopic data on atomic uranium were examined to identify candidate transitions for isotopically-selective laser excitation with diode lasers. Eleven candidate transitions were identified and evaluated for their potential usefulness for a portable uranium assay instrument. Eight of these transitions are suitable for laser induced fluorescence using different excitation and detection wavelengths, which will improve sensitivity and elemental selectivity. Data sheets on the 25 uranium transitions in the wavelength range 629 nm to 1,000 nm that originate in the ground or first excited states of neutral atomic uranium are included. Each data sheet provides the wavelength, upper and lower energy levels, angular momentum quantum numbers, ^{235}U isotope shift (relative to ^{238}U), and high-resolution spectra of weapons-grade uranium (93% ^{235}U and 7% ^{238}U).

480 (SAND–92-2587C) **Very high coercivity magnetic stripes produced by particle rotation.** Naylor, R.B. Sandia National Labs., Albuquerque, NM (United States). 1 Dec 1992. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-921295–1: Automatic Identification Manufactures (AIM) USA Magnetic Stripe Technical Committee meeting, Ft. Myers, FL (United States), 1-2 Dec 1992). Order Number DE93040331. Source: OSTI; NTIS; GPO Dep.

This paper describes a current research program at Sandia National Laboratories whereby magnetic stripes are produced through the use of a new particle rotation technology. This new process allows the stripes to be produced in bulk and then held in a latent state so that they may be encoded at a later date. Since particle rotation is less dependent on the type of magnetic particle used, very high coercivity particles could provide a way to increase both magnetic tamper-resistance and accidental erasure protection. This research was initially funded by the Department of Energy, Office of Safeguard and Security as a portion of their Science and Technology Base Development, Advanced Security Concepts program. Current program funding is being provided by Sandia National Laboratories as part of their Laboratory Directed Research and Development program.

481 (SAND–93-0011) **Potential application of the Motorola MSR-20 Radar to DOE site security.** Arlowe, D.; Rebeil, P.; Vigil, R. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000348. Source: OSTI; NTIS; GPO Dep.

This paper describes the results of testing the MSR-20 radar and provides guidance on how this radar may be used to provide early detection and warning of approaching intruders beyond DOE facility site boundaries.

482 (SAND–93-0032) **Methodology for testing metal detectors using variables test data.** Spencer, D.D.; Murray, D.W. Sandia National Labs., Livermore, CA (United States). Aug 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000347. Source: OSTI; NTIS; GPO Dep.

By extracting and analyzing measurement (variables) data from portal metal detectors whenever possible instead of the more typical "alarm"/"no-alarm" (attributes or binomial) data, we can be more informed about metal detector health with fewer tests. This testing methodology discussed in this report is an alternative to the typical binomial testing and in many ways is far superior.

483 (UCRL-CR–115408) **Results of the DOE Integrated Security System (DISS) visitor biometrics verification test.** Sweeney, D.J. Lawrence Livermore National Lab., CA (United States). Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001637. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this document is to report results of the feasibility test using the Recognition System, Inc. (RSI) 3-D HandKey Hand Reader biometrics device for verification of positive identification in the DAVACS procedure. The HandKey measures a 3-D image of the hand and generates a unique 9-byte template representation. This device has a low false reject (FR, Type I) and false accept (FA, Type II) error rates. This makes the device suitable for positive verification of a visitors identification. The DOE Automated Visitor Access Control System (DAVACS) is based on three components of responsibilities for classified visits. The one that this investigation focuses on is the positive identification of the visitor. Currently and valid picture identification (i.e. drivers license) is all that is required for proof of identify. The addition of a physical biometrics comparison as part of the identification process in the DAVACS system would increase the ability to positively identify a visitor to a facility.

484 (UCRL-JC–112769) **The Lawrence Livermore National Laboratory Intelligent Actinide Analysis System.** Buckley, W.M.; Carlson, J.B.; Koenig, Z.M. Lawrence Livermore National Lab., CA (United States). Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930749–77: 34. annual meeting of the Institute of Nuclear Materials Management, Scottsdale, AZ (United States), 18-21 Jul 1993). Order Number DE94001526. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed an Intelligent Actinide Analysis System (IAAS) for Materials Management to use in the Plutonium Facility at the Lawrence Livermore National Laboratory. The IAAS will measure isotopic ratios for plutonium and other actinides nondestructively by high-resolution gamma-ray spectrometry. This system will measure samples in a variety of matrices and containers. It will provide automated control of many aspects of the instrument that previously required manual intervention and/or control. The IAAS is a second-generation instrument, based on the authors' experience in fielding gamma isotopic systems, that is intended to advance non-destructive actinide analysis for nuclear safeguards in performance, automation, ease of use, adaptability, systems integration and extensibility to robotics. It uses a client-server distributed monitoring and control architecture. The IAAS uses MGA_3 as the isotopic analysis code. The design of the IAAS reduces the need for operator intervention, operator training, and operator exposure.

485 (UCRL-JC–112888) **MGA and passive neutron measurements.** Ruhter, W.D. (Lawrence Livermore National Lab., CA (United States)); Gunnink, R.; Baumann, S.; Abeynaike, S.; Verplancke, J. Lawrence Livermore National Lab., CA (United States). 6 Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9304211–1: European Safeguard and Research Development Association/non-destructive analysis (ESARDA/NDA) workshop on passive neutron, Ispra (Italy), 20-23 Apr 1993). Order Number DE94000390. Source: OSTI; NTIS; GPO Dep.

MGA is a gamma-ray spectrum analysis program for determining relative plutonium isotopic abundances. The isotopic composition of a plutonium sample is needed to calculate $^{240}Pu_{eff}$ that is used to interpret passive neutron coincidence measurements in units of absolute plutonium mass. MGA can determine plutonium isotopic abundances with accuracies better than 1% using a

high-resolution, low-energy, planar germanium detector and measurement times ten minutes or less. MGA can include analysis of a second spectrum of the high-energy (300–600 keV) plutonium gamma rays that significantly improves the determination of $^{240}P_{eff}$ in high-burnup plutonium. For the high-energy gamma-ray measurements we have devised a new hardware configuration, so that both the low- and high-energy gamma-ray detectors are mounted in a single cryostat thereby reducing weight and volume of the detector systems. We describe the detector configuration and our experience with it using a combined neutron-gamma measurement system and the two-detector version of MGA. We discuss the sources of uncertainty in the determination of $^{240}Pu_{eff}$ and propose a new correlation for the determination of ^{242}Pu.

486 (Y/MA–37-7212) **The Holdup Measurement System II (HMSII).** Smith, S.E. (Oak Ridge Y-12 Plant, TN (United States)); Gibson, J.S.; Halbig, J.K.; Klosterbuer, S.F.; Russo, P.A.; Sprinkle, J.K. Jr. Oak Ridge Y-12 Plant, TN (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-930749–78: 34. annual meeting of the Institute of Nuclear Materials Management, Scottsdale, AZ (United States), 18-21 Jul 1993). Order Number DE94001942. Source: OSTI; NTIS; INIS; GPO Dep.

A project is in progress that addresses two of the problems with existing holdup measurement technology: the need for compact instrumentation and a more efficient means of reducing the massive amounts of data to quantities of Special Nuclear Materials (SNM). The approach taken by the project utilizes the Miniature Modular MultiChannel Analyzer (M^3CA), a complete and truly portable gamma-ray spectroscopy system, under development at Los Alamos National Laboratory. The hardware is then integrated and automated by the Holdup Measurement System II (HMSII) software being developed by the Oak Ridge Y-12 Plant. Together they provide the hardware components, measurement control in the field, automated data acquisition, data storage and manipulation which simplify holdup measurements.

0560 Legislation and Regulations

Refer also to citation(s) 226, 256, 270, 678, 723, 1388, 2893

487 (DOE/AL/31950–T5) **Waste Isolation Pilot Plant (WIPP) fact sheet.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1993]. 138p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94001589. Source: OSTI; NTIS; INIS; GPO Dep.

Pursuant to the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), as amended (42 USC 6901, et seq.), and the New Mexico Hazardous Waste Act (Section 74-4-1 et seq., NMSA 1978), Permit is issued to the owner and operator of the US DOE, WIPP site (hereafter called the Permittee(s)) to operate a hazardous waste storage facility consisting of a container storage unit (Waste Handling Building) and two Subpart X miscellaneous below-ground storage units (Bin Scale Test Rooms 1 and 3), all are located at the above location. The Permittee must comply with all terms and conditions of this Permit. This Permit consists of the conditions contained herein, including the attachments. Applicable regulations cited are the New Mexico Hazardous Waste Management Regulations, as amended 1992 (HWMR-7), the regulations that are in effect on the date of permit issuance. This Permit shall become effective upon issuance by the Secretary of the New Mexico Environment Department and shall be in effect for a period of ten (10) years from issuance. This Permit is also based on the assumption that all information contained in the Permit application and the administrative record is accurate and that the activity will be conducted as specified in the application and the administrative record. The Permit application consists of Revision 3, as well as associated attachments and clarifying information submitted on January 25, 1993, and May 17, 1993.

488 (INIS-mf–13729) **Radiation protection instrument 1993.** Ghana. Apr 1993. 8p. Order Number DE94604691. Source: OSTI; NTIS (US Sales Only); INIS.

Legislative Instrument 1559.

The Radiation Protection Instrument, 1993 (Legislative Instrument 1559) prescribes the powers and functions of the Radiation Protection Board established under the Ghana Atomic Energy Commission by the Atomic Energy Commission (Amendment) Law, 1993 (P.N.D.C. Law 308). Also included in the Legislative Instrument are schedules on control and use of ionising radiation and radiation sources as well as procedures for notification, licensing and inspection of ionising radiation facilities. (EAA).

489 (WINCO–11949) **WINCO maintenance before and after DOE 4330.4A.** Remsburg, R.E. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). 27 Apr 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-9304219–1: Maintenance implementation plan workshop, Oak Ridge, TN (United States), 27-29 Apr 1993). Order Number DE94000924. Source: OSTI; NTIS; GPO Dep.

This report discusses numerous elements of the maintenance program at the Idaho Chemical Processing Plant (ICPP) which have undergone changes during the last 5 years. Looking back, many of the maintenance program changes prior to 1991 were fragmented. Maintenance program elements were being ratcheted to address specific productivity and safety concerns. The improvements were warranted, but often improvements were implemented without a systematic review of how they impacted other maintenance program elements. After 1990 when WINCO began using the Chapter II guidelines of DOE Order 4330.4A as a maintenance program model, there was a marked improvement in the quality of the maintenance program changes. The post 1990 changes have been part of a systematic plan that has been communicated to all of the maintenance players. The Chapter II guidelines and the maintenance implementation plan (MIP) personnel with a focus for improvement that was missing prior to 1991.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

Refer also to citation(s) 2526

0701 Physical Isotope Separation

Refer also to citation(s) 176, 2299

0702 Radiation Sources

Refer also to citation(s) 1528, 1753, 1803, 2728, 2773

490 (ANL/MSD/CP–78737) **Temperature-dependent ion beam mixing.** Rehn, L.E.; Alexander, D.E. Argonne National Lab., IL (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308122–4: International Union of Materials Research Societies on advanced materials, Tokyo (Japan), 31 Aug - 4 sep 1993). Order Number DE93040281. Source: OSTI; NTIS; INIS; GPO Dep.

Recent work on enhanced interdiffusion rates during ion-beam mixing at elevated temperatures is reviewed. As discussed previously, expected increase in ion-beam mixing rates due to 'radiation-enhanced diffusion' (RED), i.e. the free migration of isolated vacancy and interstitial defects, is well documented in single-crystal specimens in the range of 0.4 to 0.6 of absolute melting temperature. In contrast, the increase often observed at somewhat lower temperatures during ion-beam mixing of polycrystalline specimens is not well understood. However, sufficient evidence is available to show that this increase reflects intracascade enhancement of a thermally-activated process that also occurs without irradiation. Recent evidence is presented which suggests that this process is Diffusion-induced Grain-Boundary Migration (DIGM). An important complementary conclusion is that because ion-beam mixing in single-crystal specimens exhibits no significant temperature dependence below that of RED, models that invoke only irradiation-specific phenomena, e.g., cascade-overlap, thermal-spikes, or liquid-diffusion, and hence which predict

no difference in mixing behavior between single- or poly-crystalline specimens, cannot account for the existing results.

491 (CONF-931160–20) **Physics of neutron production at the Oak Ridge Electron Linear Accelerator.** Dickens, J.K. Oak Ridge National Lab., TN (United States). [1993]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94000475. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication NEUTRON SOURCES/production; TANTALUM/photonuclear reactions; ORELA; NEUTRON SOURCE FACILITIES; PRODUCTION; TANTALUM

492 (INIS-BR–3148, pp. 630-632) **Solid water phantom.** Arguiropulo, M.Y. (Sao Paulo Univ., Ribeirao Preto, SP (Brazil). Faculdade de Filosofia, Ciencias e Letras); Ghilardi Neto, T.; Pela, C.A.; Ghilardi, A.J.P. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A phantom were developed for simulating water, based in plastics. The material was evaluated for different energies, and the measures of relative transmission showed that the transmission and the water were inside of 0,6% for gamma rays. The results of this new material were presented, showing that it could be used in photon beam calibration with energies on radiotherapy range. (C.G.C.).

493 (INIS-BR–3174, pp. 67-80) **Neutron radiography.** Pugliesi, R.; Freitas, A.G. de; Gammal, A.; Rizzatti, M.R.; Vercelli, P. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

The objective was to demonstrate the main characteristics of the neutron radiography technique, which has been developed in the Nuclear Physics Department of the IPEN-CNEN-SP. Its employment, in technology varies enormously and includes among others, the inspection of the hydrogen-rich substances, highly radioactive materials, etc. The indirect conversion method with Dysprosium screen was employed. The experimental arrangement used was a neutron collimator installed in the bottom of the IEA-R1 Nuclear Research Reactor pool. Several samples were analysed which were exposed in a neutron flux $\approx 10^7$ n/s.cm^2 during 10 minutes. The obtained results confirm the main characteristics of this technique as well as its viability to be developed in this reactor. (author).

494 (INIS-mf–13731, pp. 106) **New achievements in industrial applications of nuclear track microfilters.** Vater, P. (Kernchemie, Philips-Univer., Marburg (Germany)); Laue, C.; Heise, S.; Brandt, R.; Jiang, H.; Roesch, J.; Haag, J. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/primary coolant circuits; CURIUM; ETCHING; FILTERS; HEAVY IONS; IRRADIATION; NUCLEAR POWER PLANTS; PLUTONIUM; USES; WATER

495 (INIS-mf–13731, pp. 107) **Production and applications of single-pore membranes.** Chen Yulin (Inst. of Nuclear Research, Academia Sinica, Shanghai (China)); Lin Junying; Ding Chunfa. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILMS/fission tracks; BIOLOGY; ETCHING; FILMS; OPENINGS; POLYCARBONATES; URANIUM; USES

496 (INIS-mf–13731, pp. 108) **Microfabrication of metal-semiconductor microstructures: a novel application of nuclear track filters.** Chakavarti, S.K. (Dept. of Applied Physics, Regional Engineering College, Kurukshetra (India)); Vetter, J. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/uses; FABRICATION; FILTERS; USES; METALS; MICROSTRUCTURE; SEMICONDUCTOR MATERIALS

497 (INIS-mf–13731, pp. 109) **On the development of polypropylene microfilters.** Heise, S. (Kernchemie, Philipps-Univ., Marburg (Germany)); Vater, P.; Brandt, R.; Dankmeyer, C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/polypropylene; BISMUTH 209; ETCHING; FILTERS; POLYPROPYLENE; IRRADIATION

498 (INIS-mf–13731, pp. 110) **Application of new nuclear track microporous membrane in trans-dermal therapeutic system (TTS) study.** Wu Risheng (Academia Sinica, Beijing, BJ (China). Inst. of High Energy Physics); Zhou Jian; Ke Wei. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILMS/particle tracks; DRUGS; FILMS; MEDICAL SUPPLIES; POROSITY; QUALITY CONTROL; SKIN; THERAPY; USES

499 (INIS-mf–13731, pp. 111) **Study of the system for measuring red blood cell transit time through micropores.** He Gaokui (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Huang Xiaojian; Chen Baoliu; Wang Yulan; Zhu Tiancheng. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/blood cells; FILTERS/particle tracks; DEFORMATION; ERYTHROCYTES; FILTERS; RHEOLOGY; TIME MEASUREMENT

500 (INIS-mf–13731, pp. 112) **Study on PVDF nuclear track filter.** Zhao, C.D. (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Guo Shilun. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/polyethylenes; ELECTRICAL PROPERTIES; ETCHING; FILTERS; POLYETHYLENES; USES

501 (INIS-mf–13731, pp. 198) **Production and application of particle track membranes in Hungary.** Dajko, G. (Inst. of Nuclear Research of the Hungarian Academy of Sciences (Hungary)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on

nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/membranes; HUNGARY; IRRADIATION; MEMBRANES; POLYMERS; PROTONS; USES

502 (INIS-mf–13731, pp. 200) **Diffusion of radon through nuclear track microfilters.** Hussain, G. (SSNTD-Lab., NED, PINSTECH, Islamabad (Pakistan)); Khan, H.A.; Zafar, M.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/diffusion; RADON/filters; ACTIVATION ENERGY; CELLULOSE; NITRATES; PARTICLE TRACKS; RADON; DIFFUSION; FILTERS; ULTRAVIOLET RADIATION

503 (INIS-mf–13731, pp. 373) **Application of the presoaking effects to the production of CR-39 microfilters.** Ogura, K. (Coll. of Industrial Technology, Nihon Univ., Narashino (Japan)); Naito, T.; Nakano, K.; Takahashi, T. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; CHEMICAL PREPARATION; ETCHING; FILTERS; ORGANIC POLYMERS; SENSITIVITY; USES

504 (INIS-mf–13731, pp. 374) **Development and characterization of polycarbonate microfilters.** Dey, M. (Dept. of Chemistry, North-Eastern Hill Univ., Shilong (India)); Raju, J.; Ghosh, S.; Dwivedi, K:K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/polycarbonates; FILTERS; POLYCARBONATES; IRRADIATION; PERFORMANCE; URANIUM IONS; USES

505 (INIS-mf–13731, pp. 375) **Thermal stability of pores in nuclear track microfilters.** Hussain, G. (SSNTD-Lab., NED, PINSTECH, Islamabad (Pakistan)); Khan, H.A.; Zafar, M.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FILTERS/particle tracks; FILTERS/porosity; ANNEALING; CALIFORNIUM 252; CELLULOSE; DIELECTRIC TRACK DETECTORS; FILTERS; POROSITY; IRRADIATION; NITRATES; STABILITY; ULTRAVIOLET RADIATION

506 (INIS-mf–13731, pp. 381) **A new nuclear track microporous membrane.** Wu Risheng (Inst. of High Energy Physics, Academia Sinica (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/membranes; ALPHA PARTICLES; CONTAMINATION; DIELECTRIC TRACK DETECTORS; IRRADIATION; MEMBRANES; POLYCARBONATES; POROSITY

507 (LA-UR–93-2990) **A dc Penning surface-plasma source.** Smith, H.V. Jr.; Allison, P.; Geisik, C.; Schmitt, D.R.; Schneider, J.D.; Stelzer, J.E. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308136–5: 5. international conference on ion sources, Peking (China), 31 Aug - 4 sep 1993). Order Number DE93040126. Source: OSTI; NTIS; GPO Dep.

After developing a pulsed-8X source for H^- beams, we are now testing a cooled, dc version. The design dc power density on the cathode surface is 900 W/cm^2, much higher than achieved in any previously-reported Penning surface-plasma source (SPS). The source is designed to accommodate dc arc power levels up to 30 kW by cooling the electrode surfaces with pressurized, hot water. After striking the arc using a 600-V pulser, a 350-V dc power supply is switched in to sustain the 100-V discharge. Now our tests are concentrating on arc pulse lengths $\leq$1 s. Ultimately, the discharge will be operated dc. The source is described and the initial arc test results are presented.

508 (SAND–93-0728C) **Environmental and industrial applications of pulsed power systems.** Neau, E.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930652–3: 20. IEEE international conference on plasma sciences, Vancouver (Canada), 7-9 Jun 1993). Order Number DE94000559. Source: OSTI; NTIS; INIS; GPO Dep.

The technology base formed by the development of high peak power simulators, laser drivers, free electron lasers (FEL's), and Inertial Confinement Fusion (ICF) drivers from the early 60's through the late 80's is being extended to high average power short-pulse machines with the capabilities of performing new roles in environmental cleanup applications and in supporting new types of industrial manufacturing processes. Some of these processes will require very high average beam power levels of hundreds of kilowatts to perhaps megawatts. In this paper we briefly discuss new technology capabilities and then concentrate on specific application areas that may benefit from the high specific energies and high average powers attainable with short-pulse machines.

0703 Isotopic Power Supplies

Refer also to citation(s) 272

509 (DOE/SF/18852–T31) **GPHS-RTGs in support of the Cassini mission: Semi-annual technical report, 29 March 1993–26 September 1993.** Martin Marietta Astro Space, Philadelphia, PA (United States). 24 Oct 1993. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-91SF18852. Order Number DE94001445. Source: OSTI; NTIS; GPO Dep.

The following tasks were reported on: Spacecraft integration and liaison, engineering support, safety, qualified unicouple fabrication, ETG fabrication/assembly/test, ground support equipment, RTG shipping and launch support, designs/reviews/mission applications, project management/quality assurance/contract changes.

510 (LA–12653-PR) **Heat Source Technology Program monthly progress report, July 1993.** George, T.G. (comp.). Los Alamos National Lab., NM (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002019. Source: OSTI; NTIS; GPO Dep.

This monthly report describes activities performed in support of Cassini fueled-clad production and studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Special Applications of the US Department of Energy (DOE) by Los Alamos National Laboratory (LANL). Most of the activities described are ongoing; the results and conclusions described may change as the work progresses.

511 (LA–12682-PR) **Heat Source Technology Program monthly progress report, August 1993.** George, T.G. (comp.). Los Alamos National Lab., NM (United States). Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002020. Source: OSTI; NTIS; GPO Dep.

This monthly report describes activities performed in support of Cassini fueled-clad production and studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Special Applications of the US Department of Energy (DOE) by

Los Alamos National Laboratory (LANL). Most of the activities described are ongoing; the results and conclusions described may change as the work progresses.

512 (MLM–3786) **Development testing of the two-watt RTG heat source and Hastelloy-S/T-111 alloy compatibility studies.** Howell, E.I.; Teaney, P.E. EG and G Mound Applied Technologies, Miamisburg, OH (United States). 29 Sep 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-88DP43495. Order Number DE94002875. Source: OSTI; NTIS; GPO Dep.

The two-watt radioisotope thermoelectric generator heat source capsules were tested to determine their survivability under extreme environmental conditions: high external pressure, high impact, and high internal pressure. Test results showed that the capsules could withstand external pressures of 1,000 bars and impacts at velocities near 150 meters per second. However, the results of the internal pressure tests (stress-rupture) were not so favorable, possibly because of copper contamination, leading to a recommendation for additional testing. A material compatibility study examined the use of Hastelloy-S as a material to clad the tantalum strength member of the two-watt radioisotopic heat source. Test capsules were subjected to high temperatures for various lengths of time, then cross sectioned and examined with a scanning electron microscope. Results of the study indicate that Hastelloy-S would be compatible with the underlying alloy, not only at the normal operating temperatures of the heat source, but also when exposed to the much higher temperatures of a credible accident scenario.

0706 Environmental Aspects

513 (INIS-GB–494) **Health and safety annual report 1992.** British Nuclear Fuels plc, Risley (United Kingdom). Health and Safety Directorate. 1993. 24p. Order Number DE94604432. Source: OSTI; NTIS (US Sales Only); INIS.

BNFL operates 6 sites in the United Kingdom concerned with the nuclear fuel cycle. The annual report on occupational health and safety gives information on all aspects of health and safety within BNFL with special reference to radiation doses received by the workforce and radiation protection measures taken by the company. BNFL's safety policy is set out. Radiation doses to all workers have remained low. Other industrial accidents are also listed and its safety measures for transport, radioactive effluents and in the event of an incident, are mentioned briefly. (UK).

08 HYDROGEN

514 (ETSU-R–75) **Reducing global warming through the provision of hydrogen from non-fossil fuels.** AEA Environment and Energy, Harwell (United Kingdom); East Anglia Univ., Norwich (United Kingdom). Environmental Risk Assessment Unit (ERAU). Apr 1993. 283p. Order Number DE94708972. Source: OSTI; NTIS (US Sales Only); INIS.

Concern has increased in recent years regarding the rising atmospheric concentration of carbon dioxide and its potential effect on future global climate. One element of strategies for the reduction of CO_2 emissions would be to increase the proportion of energy derived from non-fossil energy sources. This option has led to renewed interest in the use of hydrogen as an energy vector which could facilitate the transfer of non-fossil energy into a wider range of end-use sectors. To assess, in this context, the potential role of non-fossil-fuel hydrogen (NFFH), published information on the costs and performance of technologies for the production, storage, distribution and utilisation of hydrogen has been reviewed in this study. These data have been used in a model of the UK energy system to investigate the potential contributions of the various hydrogen technologies, over a 50 year timeframe, and with different levels of constraint imposed on the rate of CO_2 release. Finally, to set these reduced CO_2 release rates in the context of the resultant reduction in global warming commitment, a further modelling study has been made to estimate the residual transient warming to 2050, assuming the world as a whole follows the same CO_2 emission profiles as modelled for the UK. This 259 page report of the study contains extensive tables of data and references, and a glossary of terms, units and conversion factors. (author)

0801 Production

Refer also to citation(s) 12, 13, 27, 575, 829, 1159, 1275

515 (DOE/MC/26365–3423) **Hydrogen separation by ceramic membranes in coal gasification: Final report.** Gavalas, G.R. California Inst. of Tech., Pasadena, CA (United States). Aug 1993. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC26365. Order Number DE93000290. Source: OSTI; NTIS; GPO Dep.

The general objective of this project was to develop hydrogen permselective membranes for hydrogen production from coal gas. The project consisted of the following tasks: (i) membrane preparation and characterization, (ii) membrane stability testing, and (iii) analysis and economic evaluation of a membrane-assisted ammonia from coal process. Several oxides (SiO_2, TiO_2, Al_2O_3, B_2O_3) in dense (or nonporous) form were identified to be permselective to hydrogen at elevated temperatures. To obtain reasonable permeance it is necessary that the membrane consists of a thin selective layer of the dense oxide supported on or within the pores of a porous support tube (or plate). Early in the project we chose porous Vycor tubes (5mm ID, 7 mm OD, 40 Å mean pore diameter) supplied by Corning Inc. as the membrane support. To form the permselective layer (SiO_2, TiO_2, Al_2O_3, B_2O_3) we employed chemical vapor deposition using the reaction of the chloride ($SiCl_4$, etc.) vapor and water vapor at high temperatures. Deposition of the selective layer was carried out in a simple concentric tube reactor comprising the porous support tube surrounded by a wider concentric quartz tube and placed in an electrically heated split tube furnace. In one deposition geometry (the opposing reactants or two-sided geometry) the chloride vapor in nitrogen carrier was passed through the inner tube while the water vapor also in nitrogen carrier was passed in the same direction through the annulus between the two tubes. In the other (two-sided) geometry the chloride-containing stream and the water-containing stream were both passed through the inner tube or both through the annulus.

0802 Storage, Transport, and Handling

Refer also to citation(s) 514

0804 Economic, Industrial, and Business Aspects

Refer also to citation(s) 514

0809 Environmental Aspects

Refer also to citation(s) 514, 1153, 1306, 1308, 1311, 1316, 1342, 1353, 1361

0810 Waste Management

Refer also to citation(s) 514

09 BIOMASS FUELS

0907 Resources

Refer also to citation(s) 544

516 (CONF-930304–32) **Biomass resource potential using energy crops.** Wright, L.L.; Cushman, J.H.; Martin, S.A. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 205. American Chemical Society national meeting; Denver, CO (United States); 28 Mar - 2 apr 1993. Order Number DE93041044. Source: OSTI; NTIS; GPO Dep.

Biomass energy crops can provide a significant and environmentally beneficial source of renewable energy feedstocks for the

future. They can revitalize the agricultural sector of the US economy by providing profitable uses for marginal cropland. Energy crops include fast-growing trees, perennial grasses, and annual grasses, all capable of collecting solar energy and storing it as cellulosic compounds for several months to several years. Once solar energy is thus captured, it can be converted by means of currently available technologies to a wide variety of energy products such as electricity, heat, liquid transportation fuels, and gases. Experimental results from field trials have generated optimism that selected and improved energy crops, established on cropland with moderate limitations for crop production, have the potential for producing high yields. Both trees and grasses, under very good growing conditions, have produced average annual yields of 20 to 40 dry Mg ha^{-1} $year^{-1}$. Sorghum has shown especially high yields in the Midwest. Hybrids between sugar cane and its wild relatives, called energy cane, have yielded as much as 50 dry Mg ha^{-1} $year^{-1}$ in Florida. These experimental results demonstrate that some species have the genetic potential for very rapid growth rates. New wood energy crop systems developed by the Department of Energy's Biofuels Feedstock Development Program offer, at a minimum, a 100% increase in biomass production rates over the 2 to 4 Mg ha^{-1} $year^{-1}$ of dry leafless woody biomass produced by most natural forest systems. Experimental data indicate that short rotation wood crops established on cropland with moderate limitations are capable of producing biomass yields of 8–20 dry Mg ha^{-1} $year^{-1}$ with a present average about 11 dry Mg ha^{-1} $year^{-1}$ on typical cropland sites.

0908 Production

517 (ETSU-B–1291) **Coppiced trees as energy crops.** Tabbush, P.M. Forestry Commission, Farnham (United Kingdom). Research Div. 1993. 39p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716691. Source: OSTI; NTIS (US Sales Only).

The work reported here continued the assessment of the yield potential of short rotation coppice grown to produce high yields of dry matter for conversion to energy. The most successful species from the original trials was Populus interamericana "RAP", and at two sites, it was possible to carry out yield assessments at the end of the third and fourth cutting cycles. At the time of harvest and yield assessment, samples were taken for nutrient analysis in the laboratory so that an estimate could be made of the quantity of nutrient removed from the site at each harvest. (author)

518 (ETSU-B/W–5/00241/REP) **Energy forestry in the Forest of Mercia.** Hunt, G. Forest of Mercia, Cannock (United Kingdom). 1993. 51p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716704. Source: OSTI; NTIS (US Sales Only).

This study considers recent developments on all aspects of growing and harvesting short rotation coppice, and the economics of producing energy from wood. It then looks in detail at constraints and opportunities within the Forest of Mercia area which covers about 23,000 hectares in the West Midlands in the United Kingdom. Mechanisms for developing production and markets are discussed. Guideline costs and yields are given for each of the key stages. For comparative purposes they are wherever possible expressed in terms of oven dry tonnes (ODT) and Kilowatt Hours (kWh), but it should be borne in mind that these are only rough guidelines, as research is still underway. The general trend is towards the gradual reduction of most production and conversion costs as technology is developed. (author)

519 (NUTEK-EO–93-1) **Project Salix harvester/harvesting system Segerslaett Empire 2000.** Jonsson, Hans (M-laen Hushaallningssaellskap, Bjaerred (Sweden)). Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 1993. 14p. (In Swedish). Project NUTEK-194-013. Order Number DE94709782. Source: OSTI; NTIS.

This project has during 1991 to 1993 developed a machine for whole shoot harvest of Salix. The harvester called "Segerslaett Empire", is self-propelled with hydrostatic drive. The machine is built on the chassis on an International Harvester combine. When harvesting, first the shoots are very well controlled by two screws. They progressively fix the shoots during cutting and the early phase of the transportation of the shoots. After being transported with two bands the shoots fall on an "unloading table" where sideways going transport bands transport the shoots to a side-going trailer. This loading is done continuously. When changing trailer the transport bands are stopped and the "unloading-table" can be used as a buffer tank. This arrangement makes it possible for the harvester to work continuously and never stop. The trailer then tip off the shoots at a suitable place where it later will be chipped and transported to a heating plant. More than eight meter tall stands have been harvested with the "Empire 2000". The machine also has good off-road properties. The machine can be transported several kilometers on road as well. The harvester is now working good enough to be of commercial interest and is the best working whole-shoot harvester in Sweden today.

520 (SLU-SKOMA-R–67) **Litter mass-loss rates in late stages of decomposition at some climatically and nutritionally different pine sites, a study on the effects of climate change.** Berg, B. (Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Forest Soils); Johansson, M.B.; McClaugherty, C. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Forest Soils. 1992. 62p. Order Number DE94709805. Source: OSTI; NTIS.

The patterns of some chemical changes and litter mass-loss rates were investigated for a variety of decomposing litters in pine forests under different climatic conditions and at sites with different nutrient status. A mixed deciduous forest was also compared. In initially chemically identical Scots pine needle litter incubated under different climatic conditions the lignin concentration increased faster, as a function of accumulated mass loss when the climatic conditions promoted a higher initial mass-loss rate. Also under artificially created conditions, e.g. after fertilization and irrigation, the same phenomenon occurred. Litter mass-loss rates decreased during decomposition as lignin concentrations increased. The relative decrease was significantly larger at sites with a climate that promoted an initially higher mass-loss rate. At the same lignin concentration, the mass-loss rate was significantly lower in drier and colder conditions, viz. climatic conditions that promote a lower initial mass-loss rate. Nevertheless, it was found that at very high lignin concentrations that lignin clearly dominated over climate as a rate-regulating factor. The authors speculate about that a consequence of this observation could be a higher rate of organic-matter accumulation at sites that initially promote a high initial mass-loss rate for litter than at sites with conditions that lower initial rates, at least for a given species of litter. 44 refs, 5 figs, 14 tabs.

0909 Processing

Refer also to citation(s) 823

521 (AAA-KTF/FKF–90/10) **Gasification of black liquor at elevated pressures: Thermodynamic analysis.** Backman, R.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1990. 53p. Order Number DE94709677. Source: OSTI; NTIS.

JALO Research Programme.

This report deals with the gasification products of gasification of black liquor char at different temperatures, pressures and air ratios. The method used is a global equilibrium analysis of the gasifying system. The focus of the investigation is laid on the distribution of the key elements carbon, hydrogen, sulfur and sodium between phases as a function of gasification temperature and pressure. The gasification behaviour of both dry black liquor and devolatilized black liquor have been studied. Also some energetic properties, i.e. adiabatic temperatures and enthalpy of flue gases have been studied using total energy balances of the gasifying process.

522 (AAA-KTF/FKF–90/12-Pt.2) **Gasification of black liquor at elevated pressures: Rate data with CO_2 and water vapor.** Frederick, W.J.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 41p. Order Number DE94709678. Source: OSTI; NTIS.

JALO Research Programme.

This report deals with gasification of black liquor char under pressurized conditions, and the kinetics of gasification of black liquor char with CO_2 and water vapor. The study was made in cooperation between Aabo Akademi and the Fuel and Process Technology of the Technical Research Centre of Finland to provide fundamental data on the gasification of black liquor char at different pressures. Both the single droplet technique and pressurized thermogravimetric analysis are suitable for research of the gasification of black liquor char with water vapor and CO_2. Both methods give reproducible results, and they complement each other in terms of the data generated.

523 (AAA-KTF/FKF–93/4) **Gasification of black liquor char with H_2O under pressurized conditions.** Whitty, K.J. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1993. 96p. Order Number DE94709696. Source: OSTI; NTIS.

JALO Research Programme.

The primary objective of this study, which is a part of the project 'Basic studies in black liquor gasification', was to obtain kinetic data regarding the gasification of black liquor with steam under pressurized conditions. In particular, trends in gasification rate as a function of the partial pressures of H_2O, H_2 and CO were investigated. The activation energy of the char used was also determined. The apparatus used for the kinetic investigations was a pressurized thermogravimetric analyzer (PTGA); a description of the device as well as the experimental procedure are included in this report. Three previously proposed rate models for water vapor gasification were considered, and their applicability to the system studied was tested.

524 (AAA-KTF/FKF–93/5) **Experimental techniques for characterization of pyrolysis properties of biomasses.** Sorvari, V. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1993. 125p. (In Swedish). Order Number DE94709697. Source: OSTI; NTIS.

LIEKKI Research Programme.

The target of this study was to test and develop different laboratory methods for characterization of pyrolysis properties of biomass fuels. A completely new laboratory instrument, a pressurized net-pyrolyzer, was mounted during the study. The final target is to acquire fundamental experimental data on pyrolysis of biomasses at elevated pressure. Three laboratory methods have been tested in this study, the pressurized net-pyrolyzer, pressurized thermal gravimetry, and Pyrogas reactor, and the results of these experiments have been compared with each other. Both fast and slow pyrolysis experiments were made in order to obtain as comprehensive results as possible.

525 (ENEA-RT-AMB–90-30) **Landfill gas management: View from Italy.** De Poli, F. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Pasqualini, S. Mar 1993. 12p. (In Italian). (CONF-9010546–1: 2. international conference on landfill gas, Bournemouth (United Kingdom), 16-19 Oct 1990; RT/AMB–90-30). Order Number DE94716513. Source: OSTI; NTIS (US Sales Only).

Landfilling is the most widely used waste disposal system in Italy. More than 85% of the total refuse produced is landfilled, as the other ways still have many problems. People do not easily accept landfilling, and many regions of the country have very difficult problems in identifying new sites. At any rate, landfills are more accepted than other systems, such as incinerators. In accordance with present legislation, all landfill sites must have a biogas extraction system; only the smaller plants are allowed to avoid gas removal. For this reason, many extraction plants were built in the last few years about 10 in 1987, 25 in 1988, more 40 in 1989. A partial census the existing extraction plants showed the existence, in January, 1990, of 45 systems producing over 750,000 cubic meters of biogas (over 400 tep) per day. The plants were mainly built by two firms that have made 91% of the existing systems (93% of the daily gas yield). Anaerobic digestion of garbage in reactors was tried in the Bellaria plant, in which the organic fraction is mixed with sewage sludges in a CSTR reactor; the results were interesting from the technical point of view, but very poor as regards economics. A dry digestion plant is planned for the future.

526 (ENEA-RT-INN–92-13) **Membrane bioreactors for enzymatic hydrolysis of lactose.** Pizzichini, M. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Pilloton, R.; Pontecorvo, M.; Mignogna, G.; Fortunato, A.; Beone, F. Mar 1993. 113p. (In Italian). (RT/INN–92-13). Order Number DE94716524. Source: OSTI; NTIS (US Sales Only).

Bioreactor systems obtained by cell or enzyme immobilization offer many advantages compared with native enzyme, intact cell systems or other biocatalysts. Thus, many attempts have been made to design and use new types of bioreactor systems in order to improve performance, enhance productivity and reduce environmental impacts. Membrane bioreactors, obtained by physical immobilization of biocatalysts, in polymeric membrane support, offer such practical advantages as: a continuous separation and transformation process with low product inhibition and suitable hydraulic configuration (backflushing recycling, ultrafiltrating). Specific membrane modules (Amicon VitaFiber), for bioreactor applications are being commercialized. Beta-galctosidase enzyme has successfully been immobilized in a hollow fiber and in ceramic modules to hydrolyze lactose in waste whey. This technical report presents the general properties and performances (permeability, washing procedures, hydraulic configurations, physical and chemical properties) of both, polymeric and ceramic supports, enzyme kinetics, physical and covalent immobilization, mathematical model of the bioreactor and on-line process monitoring.

527 (ETSU-B–1271) **Nutrition and inhibition of methanogenic bacteria in the landfill environment.** Robinson, J.P.; Sturz, H.C. Queen Mary and Westfield Coll., London (United Kingdom). 1993. 73p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716700. Source: OSTI; NTIS (US Sales Only).

Chemical and physical factors which may influence the formation of methane by methanogenic bacteria in landfills have been investigated. Laboratory-scale lysimeter studies of leachate composition and biogas formation have been conducted. The effect of leachate and volatile fatty acids on methane formation by pure cultures of methane-forming bacteria have been studied in vitro. Microscopic studies of bacteria on surfaces in refuse have been carried out and the conversion of cellulose to methane in refuse samples has been investigated. The results show that formic acid is a product of waste degradation in laboratory lysimeters and in gassing landfills and is likely to b an important precursor of methane. Pure cultures of methanogenic bacteria are not inhibited by high concentrations of volatile fatty acid at neutral pH, suggesting that pH, and not accumulated acids, is inhibitory to methanogens. Methane formation in lysimeters can be stimulated by the addition of acetic, propianic and butyric acid. Phosphate and other nutrient minerals are removed from circulating leachate during active methanogenesis in lysimeters suggesting that nutrients added to the leachate may have the potential to increase methane formation. Cellulose placed in landfill waste water saturated conditions is rapidly colonized and degraded to methane and carbon dioxide. Laboratory lysimeters set up in this project have been shown to reflect the landfill environment as observed from field analysis. (UK)

528 (ETSU-B–1325) **Further studies on the role of protozoa in landfill.** Finlay, B.J.; Clarke, K.J.; Cranwell, P.A.; Embley, T.M.; Hindle, R.M.; Simon, B.M. Institute of Freshwater Ecology, Windemere (United Kingdom). 1993. 55p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Contract E/5A/CON/1325/2565. Order Number DE94716699. Source: OSTI; NTIS (US Sales Only).

The specific objectives of this study were: to determine the growth requirements of methanogen-bearing protozoa living in landfill; to measure the rate of methane generation by these 'protozoan consortia'; to quantify the role of protozoan grazing in stimulating overall microbial activity; to determine the identity of both symbiotic methanogens and host ciliates in different landfill sites. The results showed that the landfill ciliated protozoon, Metopus palaeformis, showed net growth in the temperature range 7-35°C, if the landfill material contained at least 40% water by weight. The methanogens living inside one cell of M.palaeformis produced, on average, 0.37 x 10^{-12}mol CH_4/hour. In laboratory studies, the initial rate of methane generation from landfill material was twice as great when ciliates were present. There was no experimental evidence that this

was due to ciliate grazing activity stimulating the re-cycling of essential nutrients to free-living bacteria. It is theoretically possible that acetate excreted by ciliates was converted to methane by free-living methanogens and that this was the source of ciliate-enhanced methane production. It was shown that the methanogenic bacteria living symbiotically within the ciliates are quite distinct from free-living methanogens previously described from landfill refuse. It is unlikely that the ciliates act as vectors for the transmission of methanogens between landfill sites. In conclusion, protozoon may be an important component of the landfill microbial community because they stimulate the rate of anaerobic decomposition and hence the rate of methane production. But protozoa are important only when the landfill material is wet (> 40% water) and when the temperature of the landfill does not exceed 30°C. (author)

529 (ETSU-B/B–2/00148/REP) **Elucidation of refuse interspecies interaction by use of laboratory models.** James, A.G.; Watson-Craik, I.A. Strathclyde Univ., Glasgow (United Kingdom). 1993. 40p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716702. Source: OSTI; NTIS (US Sales Only).

The controlled release of methane from landfill sites necessitates an understanding of the environmental and biotic factors influencing its production. The primary objective of this project was to investigate the interactions between the component groups of methanogenic associations isolated from refuse and hence to determine the potential effects of temperature and organic loadings on methane released from refuse. A multi-stage continuous culture model system was used to carry out the investigation on specific groups such as sulphate-reducing bacteria (SRB) or methanogenic bacteria. The results demonstrated that microbial associations isolated from the same refuse source may contain different physiological types of certain bacterial groups, thus emphasising the heterogenicity of landfill. It was also evident that, within these associations, the SRB were generally more susceptible to elevated organic loads than the methanogens. This contradicted the commonly perceived view, from previous studies with sludges, that methanogenic bacteria are more likely to experience inhibitory effects from environmental stimuli. The data indicated that different types of methanogens and SRB may characterize landfill and sludge. No evidence of thermophilic methanogenic activity was found which may reflect selection pressures in the laboratory or in the field. However, some thermophilic sulphate-reducing activity was detected and attributed to propionate-utilizing SRB. (UK)

530 (ETSU-B/SF–00196/REP) **Development and evaluation of straw slicing equipment.** Knight, A.C.; Neale, M.A.; Aldridge, G.J.; Gale, G.E. Silsoe Research Inst., Bedford (United Kingdom). 1993. 38p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716701. Source: OSTI; NTIS (US Sales Only).

A pilot rotary slicing facility for straw was set up to include bale breaking, feed metering and slicing. The target throughput capacity was to range between 1 and 10 t/h at a median straw output length of 25-30 mm. Performance evaluations were conducted for this equipment, a multi-purpose chopper fan, an agricultural cylinder chopper and a hammer mill. The results showed the rotary slicing equipment was capable of operating at up to 10 t/h whereas the chopper fan and cylinder chopper achieved lower throughputs. These three machines were appropriate for initial processing, whereas the hammer mill could not handle the long input material; it did produce much shorter output straw length at a maximum rate of 4 t/h, however. The slicing equipment consistently produced output material having a median length between 28 and 30 mm; the chopper fan had much greater variability ranging from 78 to 103 mm median; the cylinder chopper was adjustable for a range of output lengths but these did not correspond to those produced in practice. The slicer had a specific power requirement of 1.56 kWR/t with fluctuations of 40%; corresponding values for the chopper fan, cylinder chopper and hammer mill were respectively 4.19 (30%), 1.63 (108%) and 8.15 (25%). The overall conclusion is that the slicing equipment is the most suitable machine for reducing straw to approximately 30 mm median. If further length reduction is needed, then a hammer mill would be required with a consequential higher overall power demand. (UK)

531 (ETSU-B/SF–00202/REP) **Advances in wafering technology.** Bass, R.J.; Williams, P.G.; Brown, D.A.G. Stamford Consulting Group (United Kingdom). 1993. 59p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716703. Source: OSTI; NTIS (US Sales Only).

Some of the important issues associated with the production of straw wafers and their long term stability have been clarified. The two prototype machines developed led to further fundamental investigations. A new machine design has been produced which incorporates the main findings of the research and development work. The target price for a pre-production prototype has been estimated at between Pound 70,000 and Pound 100,000. A commercial review of the major changes in the market place since the inception of the project has been produced. The original work on the machines was directed towards a fuel briquette market. Time has demonstrated that the most likely outlets for the technology are in other areas and the future fuel market is different from that originally envisaged. (author)

532 (ETSU-B/W–1/00146/REP/A) **Storage and drying of comminuted forest residues. V. 2: Appendices.** Nellist, M.E.; Lamond, W.J.; Pringle, R.T.; Burfoot, D. AFRC Engineering, Silsoe (United Kingdom). 1993. 211p. Order Number DE94711471. Source: OSTI; NTIS (US Sales Only).

The 5 appendices to the main report of the study provide papers and data on the following aspects of the topic: moisture and energy content of comminuted wood; data on particle size; experimental work on drying properties; large scale experiments on ambient air drying of woodchips for fuel; modelling. The volume is over 200 pages long and contains a substantial number of references, graphs and tables of data. (UK)

533 (EUR–14404) **Large-scale manure processing with biogas generation.** Commission of the European Communities, Luxembourg (Luxembourg). 1992. 107p. (In Dutch, English). Contract BM/372/85/NL. Source: OSTI; NTIS (US Sales Only).

The purpose of this project was to examine if large-scale fermentation of manure according to the two-phase principle would demonstrate a better energy production than the traditionally applied digesters according to the stirred one-phase principle. At the same time this project examines on a relevant scale whether fermentation of manure constitutes a reliable and economically justified part of large-scale manure processing. For this purpose two digesters were examined, of which the most important characteristic was the division of the fermentation tank into two separate compartments. As a result of this division the digester has the possibility of making the fermentation run in two phases. (author). 7 tabs., appendices.

534 (SNV–4157) **Handling of landfill gas: Proposals for guidelines.** Persson, B.L. (MGT Teknik AB, DeponiGas Teknik AB (Sweden)). Swedish Environmental Protection Agency, Solna (Sweden). Mar 1993. 53p. (In Swedish). Order Number DE94709798. Source: OSTI; NTIS.

Various technologies for recovering methane at sanitary landfills are reviewed, together with environmental regulations in Britain, Germany and USA for this area. Analyses of landfill gas at sites in Sweden and abroad are reproduced. Suggestions are given for future swedish regulations for landfill gas recovery. 24 refs, 19 figs, 7 tabs

535 (SNV–4158) **Landfill gas generation: Proposals for guidelines.** Brolin, L. (Vattenfall Energisystem AB, Vaellingby (Sweden)); Hagelberg, M.; Sundell, P.; Stroem, E.; Johansson, C.G. Swedish Environmental Protection Agency, Solna (Sweden). Mar 1993. 60p. (In Swedish). Order Number DE94709799. Source: OSTI; NTIS.

Statistics have been compiled on active and closed landfills in Sweden, numbering about 300 and 4000 respectively. Mechanisms and potentials for methane production are briefly reviewed, and criteria are developed for selecting landfills that should be equipped with methane recovery plants. The following criteria are suggested: Landfills should have methane recovery systems if, - they receive municipal waste from at least 10,000 persons or more than 3,000 tons/year. Recovery should begin within 5 years after deposition and continue for at least 25 years., - they receive large quantities

of organic waste from industry, or sludge that has not been treated biologically. Exceptions can be made if proved that gas recovery is not possible., - closed landfills over 200,000 m^3. Exceptions as above, and for landfills closed before 1965. The limit, where recovery is not considered to be possible, may be: less than 150 kW and a net cost of 0.3-0.4 SEK/kWh (about 0.04-0.05 USD/kWh). 23 refs, 42 figs

0920 Combustion

Refer also to citation(s) 45

536 (AAA-KTF/FKF–91/9) **Steady-state kraft char bed model.** Frederick, W.J.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 35p. Order Number DE94709683. Source: OSTI; NTIS.

LIEKKI Research Programme.

The objective of this project was to create a steady-state model of a char bed which describes all of its important features and is suitable for incorporation into a steady-state global recovery boiler model. The char bed model developed in this work calculates the temperature of the active zone in a char bed, the rate of carbon burned, the degree of sulphate reduction, and the flow rates of gas and smelt leaving the char bed. It requires as inputs the rate of input of char to the bed, its composition and temperature, the net heat flux to the bed, the gas composition above the bed, and either the gas velocity just above the bed or the mass transfer coefficient from the gases to the bed surface. When the char bed model is incorporated into a global recovery boiler model, the net heat flux to the bed will be calculated implicitly since the bed surface temperature and heat flux to the bed are independent. The model also calculates the net rate of carbon accumulation in the char beds as the difference between the rate of carbon reaching the bed as char and that leaving as combustion or gasification products. The degree of sulphate reduction calculations are the weakest part of the char bed model. They are based on Grace's kinetic data, which Grace believes may underestimate the rate of reduction. They require, as input, also the degree of reduction in the particle as it reaches the char bed. This may require that reduction be tracked during in-flight combustion as well. Finally, the reduction calculations are particle size dependent and require iterative solution of a non-steady state reduction model iteratively with the steady-state char bed model. An alterative approach to simplify the sulphate reduction calculations is suggested in the report. The model also does not account for smelt reoxidation after the char carbon is consumed.

537 (AAA-KTF/FKF–91/11) **Laboratory studies on combustibility of black liquors.** Noopila, T. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1991. 76p. Order Number DE94709685. Source: OSTI; NTIS.

LIEKKI Research Programme.

The laboratory tests of the combustibility and the combustion properties of black liquors are reviewed in this work. The main objectives of this work were to compare and evaluate the different laboratory methods recently proposed for characterizing black liquor burning and the variables affecting on the combustion behaviour of the liquors, and to find out if there is any correlation between black liquor composition and liquor burning behaviour. The method used in these studies is a single droplet method developed by Hupa et al. at Aabo Akademi. The method has shown to give reliable results for black liquor combustion parameters, and good reproducibility has been achieved for the results. The conditions in the laboratory furnace are not directly comparable to a recovery furnace, but the laboratory furnace is very suitable for comparing combustion behaviour of different liquors. This thesis consists of introductory part reviewing the previous works, presents the single droplet method, and briefly discusses the reliability of this method. Attention has been paid on reproducibility and statistical significance of the results. Further data of swelling at high and low temperatures has been discussed. The thesis also contains 3 appendixes, the first of which is a study, where two different methods proposed to be used for studying black liquor combustion behaviour in a laboratory environment has been compared. In the second appendix the relationship between black liquor composition and combustion behaviour has been studied. The third appendix presents a study of combustibility of black liquors with different rheological and chemical properties. The aim of this work was to study the correlation between the viscosity and liquor combustion properties.

538 (AAA-KTF/FKF–93/3) **Combustion properties of kraft black liquors.** Frederick, W.J.; Hupa, M. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1993. 149p. Order Number DE94709695. Source: OSTI; NTIS.

LIEKKI Research Programme.

This report deals with the results obtained in a study of the phenomena involving the combustion characteristics of black liquor droplets, and the numerical model developed for modelling of combustion properties of black liquor droplets. The model required certain black liquor specific combustion information which was not currently available, and additional data was needed for evaluation of the model. The overall objectives of the project reported here was to provide experimental data on key aspects of black liquor combustion, to interpret the data, and to put it into a form which would be useful for computational models for recovery boilers. The specific topics to be investigated were: 1. the volatiles and char carbon yields from pyrolysis of single black liquor droplets, 2. a criterion for the onset of devolatilization and the accompanying rapid swelling, and 3. the surface temperature of black liquor droplets during pyrolysis, combustion and gasification. The results of the experimental investigations of these areas are presented in chapters 3-5 of this report. Additional information on the swelling characteristics of black liquor droplets was also obtained as a part of the experiments conducted. A summary of swelling characteristics of black liquor, containing new data from this study and in the form of computational model, is included.

539 (ETSU-B–1311) **Appraisal of a Lucas Furnaces Ltd. cyclonic furnace fired by woodwaste at Airsprung Beds Ltd., Trowbridge.** FEC Energy and Environmental Services, Oldham (United Kingdom). 1993. 27p. Order Number DE94708973. Source: OSTI; NTIS (US Sales Only).

The furnace is fired by woodwaste which also contains a small proportion of textiles and coir fibre. This waste arises from the manufacture of beds on the site. The Lucas furnace was installed in 1968 and subsequently upgraded in 1979 by replacing the combustor unit with a larger model. The plant consists of a vertical cylinder with refractory lining, the hot products of combustion leave the furnace vertically via a central duct at the top of the furnace. The operating principle makes use of the cyclone effect. The fuel and combustion air are introduced into the furnace tangentially at high speed to create a vortex within the combustion chamber. This vortex causes the products of combustion to circulate with hottest gases creating a high temperature central core through which all the products must pass in order to leave the furnace. The objectives of the project were to evaluate the furnace for its suitability for firing woodwaste and to determine whether further investigation and trials with other fuels on this type of furnace would be useful. The assessment of the furnace and boiler system were based on the combustion efficiency, overall thermal efficiency, flue gas emissions and economics and reliability of the installation. Some improvements are suggested as a result of the study but the overall conclusion is that the operating principle of the system, which ensures high temperature and good turbulence, has been proved to be sound. It seems likely that the combustor may have potential for other feedstocks and further trials are recommended. (author)

540 (SVF–469) **Experiences from test firing of alternative biofuels - Agro-fuels.** Ryden, A. (S.E.P. Scandinavian Energy Project AB (Sweden)); Olofsson, J. Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 75p. (In Swedish). Order Number DE94709787. Source: OSTI; NTIS.

A growing interest in agricultural fuels has led to the conclusion that it is of importance to systematize the Swedish experiences from combustion of this type of fuels. Many test runs have been performed, with documentation in a varying extent. In addition, a fuel mix with a very small amount of agricultural fuel has been used at many of the test runs. Altogether this makes it difficult to draw general conclusions from the results. Out of a total of 51 Swedish plants, 17 have been firing grain, 16 have been firing straw, 10 energy crops, e.g. canary grass, and 7 some type of 'olive fuel'. Some operating experiences from the test runs are: (1)

Problems with the fuel handling system, mainly when straw fuel is fired - straw and energy crop, e.g. reed canary grass., (2) Dusting in the fuel handling system, when crushed olive pips and grain is utilized., (3) Reduced maximal load for agricultural fuels, in comparison to the ordinary design fuels., (4) Low ash melting point causing sintering, most common when straw, grain, and 'olive fuels' are fired., (5) By firing grain in a grate fired boiler, a large amount of grain is falling through the grate, resulting in a high amount of unburnt fuel and a loss in efficiency. Accessible environmental data shows that most of the plants generally have reached a high combustion efficiency and low CO-emissions by conversion to agricultural fuels. At the same time the NO_x emissions have increased, which might be caused of a higher nitrogen content in the 'new' fuel or that the operating conditions have not been optimized. A summary of the danish experiences from burning straw is also included in this report. 16 refs, 4 figs, 4 tabs

0930 Economic, Industrial, and Business Aspects

Refer also to citation(s) 516, 824, 963

0940 Transport, Handling, and Storage

541 (ETSU-B–1366) **Airtight storage of wood chips for use as a fuel.** Lamond, W.J.; Graham, R.; Boyd, J.E.L.; Harling, R.; Lowe, J.F. Scottish Agricultural Coll., Penicuik (United Kingdom). 1993. 38p. Contract E/5A/1366/2793. Order Number DE94711476. Source: OSTI; NTIS (US Sales Only).

This study was carried out to see if airtight storage was a possible alternative to drying as a procedure for the successful storage of chipped wood for fuel. Twelve insulated bins, with a capacity of approximately 0.1 m^3 each, were filled with freshly cut Sitka Spruce wood chips. Ten of these bins were sealed immediately after filling and the remaining two left unsealed for the duration of the experiment (12 months). The programme of sampling for gas, moisture content, mycology and bacteriology is described. The results showed that sealed storage reduced the overall dry matter loss in the bins to around 1% per month compared to 2% for the unsealed bins. This compares favourably with losses of around 3% per month which have been reported for open stacks of chips with much lower initial moisture contents than that used in these experiments. There was a slight reduction in the colorific value of oven dried chips between the initial and after storage samples. The moisture content of the chips in all the bins increased over the storage period. The average energy loss was 2.9% per month for sealed and 2.0% per month for unsealed treatment. A typical ecological succession was shown by the chips, commencing with field fungi and terminating with a dominant yeast population. Potential costs for suitable stores vary from Pounds 1.27 per m^3 per year for a plastic covered outdoor stack to Pounds 11.72 per m^3 per year for a vitreous enamel silo. (UK)

542 (ETSU-B/FW–00234/REP) **Study of location of major UK tyre deposits.** Scott, P.J. AEA Environment and Energy, Harwell (United Kingdom). 1993. 29p. Order Number DE94711473. Source: OSTI; NTIS (US Sales Only).

The availability in the United Kingdom of scrap tyres which could be used as fuel in a power station has been investigated. Information related to current arisings of waste tyres is already available but it is known that for more than 50 years tyres have been scrapped and disposed of in progressively increasing numbers. Enquiries made with the Planning Officers and Waste Disposal Officers of local authorities have yielded data on most authorized disposal sites but much of the tipping which took place in the 50s and 60s is acknowledged to have been on unauthorized sites. In the case of 17 of the reported sites, tyres had been mixed with other waste in the general body of the tipping site so as to make recovery virtually impossible. In the remaining 28 sites, approximately 22 x 10^6 tyres were said to be lying in 21 sites while at 7 sites it was not possible to indicate the like quantity although one was described as having very large quantities. It is currently not known with any degree of certainty how many of the tyres in the 28 sites identified could be 'mined' for in energy-from-waste schemes. In two appendices the results of enquiries to local authorities are recorded and identified sites with numbers of tyres, where known, listed. (UK)

543 (ETSU-B/W–1/00146/REP) **Storage and drying of comminuted forest residues. V. 1: The report.** Nellist, M.E.; Lamond, W.J.; Pringle, R.T.; Burfoot, D. AFRC Engineering, Silsoe (United Kingdom). 1993. 82p. Order Number DE94711470. Source: OSTI; NTIS (US Sales Only).

Forest residues, those parts of trees unsuitable for use as timber, represent a considerable source of energy which could be reclaimed by combustion. A vital link in the chain from forest to combustion site is the storage and, if necessary drying, of the comminuted residues. This storage will normally take place within, or at the edge of, the forest where facilities and energy supplies are minimal. Because of this the present study has investigated the potential for using unheated air for the drying and control of temperature in large piles of chips. (author)

0950 Environmental Aspects

544 (NUTEK-R–93-26) **Granulated wood ash to forest soil - Ecological effects.** Rosen, K. (Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Forest Soils); Eriksson, H.; Clarholm, M.; Lundkvist, H.; Rudebeck, A. Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 1993. 64p. (In Swedish). Project NUTEK-146-928. Order Number DE94709781. Source: OSTI; NTIS; INIS.

This report describes research concerning ecological effects of wood ash recycling to forest soils. The main part of the minerals in the wood fuels are retained in the ashes after combustion. By returning the ashes back to the cleared forest areas, the mineral losses can be reduced. Adding ashes and limestone is a method to vitalize acidified forest soils and restore the production capacity. 48 refs, 26 figs, 8 tabs

0960 Health and Safety

Refer also to citation(s) 545

0970 Legislation and Regulations

Refer also to citation(s) 545

0980 Waste Management

Refer also to citation(s) 974

545 (ETSU-B–1359) **Design and cost assessment for compliance with proposed EC hazardous waste incineration directive for small-scale plant.** Srinivasan, G.; Beard, G. Atkins (W.S.) Consultants Ltd., Epsom (United Kingdom). 1993. 81p. Order Number DE94711469. Source: OSTI; NTIS (US Sales Only).

The European Commission has proposed stringent controls to limit the emissions from all "hazardous" waste incinerators. These limits will apply to all plants regardless of size. This may impact significantly on the economic viability of exploiting wastes deemed hazardous as an energy source. The objective of this study was to provide feasibility assessments and cost data for a range of pollution abatement technologies designed to meet the draft EC Hazardous Waste Incineration directive for a range of waste feedstocks at the small scale (<5 MWth). Following discussions with the UK Energy Technology Support Unit (ETSU) it was decided to focus the study on clinical waste incineration at a scale of 1te/hr as a "worst case" process representative of such applications. It is also an application where there is currently considerable activity and for which comprehensive emissions data exist. The identification of the technologies for detailed study was made in joint discussion with ETSU. As a result six companies were engaged who, between them, had experience in a wide range of gas cleaning processes covering wet, semi-dry and dry gas cleaning techniques. The six contractors were provided with a Performance Specification to ensure a common basis for the design of the gas cleaning systems. The contractors were given the freedom to select what they considered to be the most appropriate abatement

technology. However, a key requirement was that the plants had to be capable of cleaning the specified flue gas to within the levels being proposed by the EC at a minimum cost. (author)

0990 Products and By-Products

Refer also to citation(s) 525

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 27, 38, 575

546 (DOE/PC/90046–T1) **Heterogeneous catalytic process for alcohol fuels from syngas: Fifth quarterly technical progress report, January–March, 1993.** Union Carbide Chemicals and Plastics Co., Inc., South Charleston, WV (United States). South Charleston Technical Center. [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90046. Order Number DE94002157. Source: OSTI; NTIS; GPO Dep.

Objective is to evaluate heterogeneous catalysts for converting syngas to oxygenates for use as fuel enhancers, and to develop the best total process for converting syngas to liquid fuels. Two tasks are being pursued: Catalyst R and D, and engineering studies. Initial work will be on the isobutanol catalyst system. A microreactor has been prepared for screening heterogeneous catalysts.

1009 Environmental Aspects

Refer also to citation(s) 1318, 1331, 1343

13 HYDRO ENERGY

Refer also to citation(s) 2263, 2265, 2269, 2271

1301 Resources and Availability

547 (DOE/BP/21985–4) **Irrigation depletions 1928–1989: 1990 level of irrigation, Snake Yakima and Deschutes River Basins.** USDOE Bonneville Power Administration, Portland, OR (United States); Crook (A.G.) Co., Beaverton, OR (United States). Jul 1993. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP21985. Order Number DE94000947. Source: OSTI; NTIS; GPO Dep.

The vast amount of irrigation in relation to the available water and extensive system of reservoirs located in the Snake River Basin above Brownlee reservoir precludes this area from using methods such as Blaney-Criddle for estimating irrigation depletions. Also the hydrology, irrigation growth patterns, and water supply problems are unique and complex. Therefore regulation studies were utilized to reflect the net effect on streamflow of the changes in irrigated acreage in terms of corresponding changes in storage regulation and in the amount of water depleted and diverted from and returned to the river system. The regulation study for 1990 conditions was conducted by the Idaho Department of Water Resources. The end product of the basin simulation is 61 years of regulated flows at various points in the river system that are based on 1990 conditions. Data used by the Idaho Department of Water Resources is presented in this section and includes natural gains to the river system and diversions from the river system based on a 1990 level of development and operation criteria. Additional information can be obtained for an Idaho Department of Water Resources Open-File Report "Stream Flows in the Snake River Basin 1989 Conditions of Use and Management" dated June 1991. Similar considerations apply to the Yakima and Deschutes river basins.

548 (DOE/BP/21985–7) **Modified streamflows 1990 level of irrigation: Columbia River and coastal basins, 1928–1989.** USDOE Bonneville Power Administration, Portland, OR (United States); Crook (A.G.) Co., Beaverton, OR (United States). Apr 1993. 279p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP21985. Order Number DE94000949. Source: OSTI; NTIS; GPO Dep.

The annual operation plans described in the following sections require detailed system regulation computer model studies. These system regulation studies are necessary to evaluate potential new projects and to develop operational rule curves for the existing system of projects. The objective is to provide a basis for evaluating alternative system regulation scenarios. This provides essential input for optimizing the management of existing projects and planning future projects for the most beneficial use of the water supply and resources in the entire region. Historical streamflows per se are inadequate for system regulation studies because the pattern of observed flow has continually changed with each successive stage of irrigation and e development. The problem, therefore, is to adjust for past operation of storage projects and to determine the necessary adjustments that should be made to recorded flows to reflect current stages of irrigation development. Historical flows which have been adjusted to a common level of irrigation development by correcting for the effects of diversion demand, return flow, and change-of-contents and evaporation in upstream reservoirs and lakes are referred to as modified flows. This report describes the development of irrigation depletion adjustments and modified flows for the 1990 level of development for the 61-year period 1928–1989. incremental depletion adjustments were computed in this report for each month of the 61-year period to adjust the effects of actual irrigation in each year up to that which would have been experienced with the irrigation as practiced in 1990.

1305 Economic, Industrial and Business Aspects

Refer also to citation(s) 823

549 (DOE/EA–0467-Rev.-App.) **Revised Environmental Assessment for the Sacramento Area Office Western Area Power Administration, 1994 Power Marketing Plan: Appendices.** USDOE Western Area Power Administration, Sacramento, CA (United States). Sacramento Area Office. Aug 1992. 293p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93016649. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents information on power marketing; expiring contracts; economic methods and assumptions; detailed power supply cost data; guidelines and acceptance criteria for conservation and renewable energy projects; hourly flow impacts graphs; difference in hydro dispatch; generation data; flow data; fishery resources of the Sacramento River; and water quality.

550 (DOE/EIA–M053) **Model documentation report: Short-Term Hydroelectric Generation Model.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. Aug 1993. 25p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040456. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to define the objectives of the Short- Term Hydroelectric Generation Model (STHGM), describe its basic approach, and to provide details on the model structure. This report is intended as a reference document for model analysts, users, and the general public. Documentation of the model is in accordance with the Energy Information Administration's (AYE) legal obligation to provide adequate documentation in support of its models (Public Law 94-385, Section 57.b.2). The STHGM performs a short-term (18 to 27- month) forecast of hydroelectric generation in the United States using an autoregressive integrated moving average (UREMIA) time series model with precipitation as an explanatory variable. The model results are used as input for the short-term Energy Outlook.

1306 Environmental Aspects

551 (DOE/BP/60629–6) **Integrated hatchery operations team: Operation plans for anadromous fish production facilities in the Columbia River Basin: Volume 4 addendum: Rocky Reach Hatchery, Annual report 1992.** Peck, L. (Washington Dept. of Fisheries, Olympia, WA (United States)). USDOE Bonneville Power Administration, Portland, OR (United States). Div. of Fish and Wildlife; Washington Dept. of Fisheries, Olympia, WA

(United States). Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-91BP60629. Order Number DE94000945. Source: OSTI; NTIS; GPO Dep.

Rocky Reach Hatchery is located along the Columbia Paver, just downstream from Rocky Reach Dam. Site elevation is 800 feet above sea level. The Turtle Rock Island facility, located 2 miles upstream, is operated as a satellite facility (shared with the Washington Department of Wildlife). The facility is staffed with 2.75 FTE'S. The hatchery was originally designed as a mile-long spawning channel at Turtle Rock Island. Rearing units consist of eight vinyl raceways at Rocky Reach and four rearing ponds at Turtle Rock. Water rights are held by Chelan County PUD and total 3,613 gpm from the Columbia River. Water available for use in the Turtle Rock rearing ponds averages 12,000 gpm from the Columbia River. Rocky Reach Hatchery and the Turtle Rock satellite facility are owned by Chelan County PUD. They are operated as mitigation facilities for the fishery impacts caused by the construction and operation of Rocky Reach Dam. Rocky Reach Hatchery is used for incubation and early rearing of upriver bright (URB) fall chinook. Fingerlings are later transferred to the Turtle Rock facility for final rearing and release.

552 (DOE/EA–0467-Rev.) **Revised Environmental Assessment for the Sacramento Area Office Western Area Power Administration, 1994 Power Marketing Plan.** USDOE Western Area Power Administration, Sacramento, CA (United States). Sacramento Area Office. Aug 1992. 94p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93016648. Source: OSTI; NTIS; GPO Dep.

This revised EA comprises both the original EA and the additional completed studies. Additional explanatory information is now included in this revised EA so that a reader, unfamiliar with the marketing of the CVP's hydropower resource, may more fully understand Western's Marketing Plan. Other differences between the original and this revised EA include greater analysis of the physical environment with respect to aquatic and terrestrial resources.

553 (ORNL/TM–12493) **Expert initial review of Columbia River Basin salmonid management models: Summary report.** Barnthouse, L.W. Oak Ridge National Lab., TN (United States). Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002188. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4164.

Over the past years, several fish passage models have been developed to examine the downstream survival of salmon during their annual migration through the Columbia River reservoir system to below Bonneville Dam. More recently, models have been created to simulate the survival of salmon throughout the entire life cycle. The models are used by various regional agencies and native American tribes to assess impacts of dam operation, harvesting, and predation on salmonid abundance. These models are now also being used to assess extinction probabilities and evaluate restoration alternatives for threatened and endangered salmonid stocks. Oak Ridge National Laboratory (ORNL) coordinated an initial evaluation of the principal models by a panel of outside, expert reviewers. None of the models were unequivocally endorsed by any reviewer. Significant strengths and weaknesses were noted for each with respect to reasonability of assumptions and equations, adequacy of documentation, adequacy of supporting data, and calibration procedures. Although the models reviewed differ in some important respects, all reflect a common conceptual basis in classical population dynamic theory and a common empirical basis consisting of the available time series of salmonid stock data, hydrographic records, experimental studies of dam passage parameters, and measurements of reservoir mortality. The results of this initial review are not to be construed as a comprehensive scientific peer review of existing Columbia River Basin (CRB) salmon population models and data. The peer review process can be enhanced further by a dynamic exchange regional modelers and scientific panel experts involving interaction and feedback.

14 SOLAR ENERGY

1403 Economic, Industrial, and Business Aspects

Refer also to citation(s) 557, 581, 824

1405 Solar Energy Conversion

Refer also to citation(s) 1275, 1276, 2130, 2588

554 (DOE/FTR–93013879) **Participation in the 5th international conference on indium phosphide and related materials: Foreign trip report, April 17–23, 1993.** Coutts, T.J.; Wanlass, M.W. National Renewable Energy Lab., Golden, CO (United States). 21 May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93013879. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Conference papers thought relevant to the NREL work are reviewed briefly.

555 (ETSU-S–1329-P1) **Review of photoconversion processes.** Atkins (W.S.) Consultants Ltd., Epsom (United Kingdom). 1993. 39p. Order Number DE94708974. Source: OSTI; NTIS (US Sales Only).

Forward projections from the scientific research base show a prospect for successful developments of three processes becoming economic in the UK at around three or four times the present real cost of energy. This does not include the cost of land. These processes will demand considerable surface areas, though less than current lower-technology alternatives for producing energy from sunlight. The first is electricity generation by electrochemical photovoltaic cells. These have the potential to be more robust than the analogous solid-state photovoltaic cells, and if electrolyte lifetimes can be extended to the extent that they can be manufactured as tapes, also considerably cheaper. The second process is hydrogen generation by photosynthetic bacteria, blue-green algae etc. on an effluent or other waste biomas substrate. A key issue to address in process development is competition from organisms that do not produce fuel. Thirdly photoelectrolysis for the production of hydrogen could become of major interest if the above processes strike insuperable barriers to further development. It presently offers lower solar efficiency and more expensive construction than they do. These disadvantages are thought to be inherent. Other systems examined do not show anything like the same prospects for economic value when developed to industrial scale. (author)

556 (NREL/TP–410-5812) **NREL photovoltaic subcontract reports: Abstracts and document control information, 1 August 1992–31 July 1993.** National Renewable Energy Lab., Golden, CO (United States). Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018218. Source: OSTI; NTIS; GPO Dep.

This report contains document control information and abstracts for the National Renewable Energy Laboratory (NREL) subcontracted photovoltaic (PV) program publications. It also lists source information on additional publications that describe US Department of Energy (DOE) PV research activities. It is not totally exhaustive, so it lists NREL contacts for requesting further information on the DOE and NREL PV programs. This report covers the period from August 1, 1992, through July 31, 1993. This report is published periodically, with the previous one covering the period from August 1, 1991, through July 31, 1992. The purpose of continuing this type of publication is to help keep people abreast of specific PV interests, while maintaining a balance on the costs to the PV program. The information in this report is organized under PV technology areas: Amorphous Silicon Research; Polycrystalline Thin Films (including copper indium diselenide, cadmium telluride, and thin-film silicon); Crystalline Materials and Advanced Concepts (including silicon, gallium arsenide, and other group III-V materials); PV Manufacturing Technology Development (which may include manufacturing information for various types of PV materials).

557 (NREL/TP–411-5501) **Progress in phases 2 and 3 of the Photovoltaic Manufacturing Technology Project (PVMaT).**

Witt, C.E. (National Renewable Energy Lab., Golden, CO (United States)); Mitchell, R.L.; Mooney, G.D.; Herwig, L.O.; Hasti, D.; Sellers, R. National Renewable Energy Lab., Golden, CO (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. (CONF-930540–11: 23. Institute of Electrical and Electronic Engineers (IEEE) photovoltaic specialists conference, Louisville, KY (United States), 10-14 May 1993). Order Number DE94000206. Source: OSTI; NTIS; GPO Dep.

This first year of the process-specific activities of the Photovoltaic Manufacturing Technology (PVMaT) project has been completed, and the first subcontracts for teamed efforts on R&D of a general nature have been awarded. A second solicitation for process-specific research and development (R&D) is in the evaluation stage for award of subcontracts. This paper describes the technical accomplishments of the first process-specific subcontracts (Phase 2A), the status of the teamed research (Phase 3A), and the status of the solicitation for the second process-specific solicitation (Phases 2B).

558 (NREL/TP–411-5738) **Mobil Solar Energy Corporation thin EFG octagons: Semiannual subcontract report, 1 April 1992–30 September 1992.** Kalejs, J.P. (Mobil Solar Energy Corp., Billerica, MA (United States)). National Renewable Energy Lab., Golden, CO (United States); Mobil Solar Energy Corp., Billerica, MA (United States). Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018222. Source: OSTI; NTIS; GPO Dep.

This report describes work carried out for the PVMaT program at Mobil Solar for the period covering April 1, 1992, to September 30, 1992. Mobil Solar is developing advanced technology for growing and cutting 200-μm-thick edge-defined film-fed growth (EFG) octagon tubes that will reduce the manufacturing costs of 10-cm $\times$ 10-cm polycrystalline EFG silicon wafers. Mobil Solar has made progress in identifying factors that impact on thickness nonuniformity and means to reduce the deleterious impact of ambient-related effects that have caused reduction in crystal growth productivity and wafer yield. The current main obstacle to meeting material yield targets arises due to the buckling produced by thermal stress. Studies of laser cutting of EFG silicon using ND:YAG and dye lasers are underway to develop reduced damage cutting methods. Mobil Solar has carried out design reviews for crystal growth and laser cutting equipment. A task has been initiated to evaluate new online sensors for crystal growth process control and to study implementation of advanced control concepts for productivity and yield improvements.

559 (NREL/TP–411-5739) **Amorphous silicon PVMaT Phase 2A: Semiannual subcontract report, 1 May 1992–31 October 1992.** Duran, G. (Utility Power Group, Chatsworth, CA (United States)); Mackamul, K.; Metcalf, D.; Stern, M.; Volltrauer, H.; Varar, T.; Urbanski, E.; DiBiaso, T.; Skinner, D. National Renewable Energy Lab., Golden, CO (United States); Utility Power Group, Chatsworth, CA (United States); Advanced Photovoltaic Systems, Inc., Princeton, NJ (United States). Sep 1993. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018221. Source: OSTI; NTIS; GPO Dep.

This report describes work done under a subcontract to significantly advance the photovoltaic manufacturing technologies, reduce module production costs, increase average module performance, and increase the production capacity existing at Utility Power Group (UPG) and Advanced Photovoltaic Systems, Inc. (APS). Areas of focus include (1) encapsulation and termination, (2) product design, (3) process and quality control, and (4) automation. UPG will improve its encapsulation system through the development of advanced encapsulation materials and processes that result in a module that does not require backing glass. In addition, UPG will work to develop advanced termination materials and processes. APS will perform development activities centered on the EUREKA manufacturing line. Developments in the APS EUREKA encapsulation system will be in addition to the UPG activity on encapsulation, and will offer an alternative approach to the problems of encapsulating large-area thin-film modules.

560 (NREL/TP–413-5752) **Thin-film CdTe and $CuInSe_2$ photovoltaic technologies.** Ullal, H.S.; Zweibel, K.; von Roedern, B.G. National Renewable Energy Lab., Golden, CO (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. (CONF-930838–1: International Solar Energy Society world congress, Budapest (Hungary), 23-27 Aug 1993). Order Number DE93018217. Source: OSTI; NTIS; GPO Dep.

Total-area conversion efficiency of 15%–15.8% have been achieved for thin-film CdTe and CIS solar cells. Modules with power output of 5–53 W have been demonstrated by several groups world-wide. Critical processes and reaction pathways for achieving excellent PV devices have been eluciated. Research, development and technical issues have been identified, which could result in potential improvements in device and module performance. A 1-kW thin-film CdTe array has been installed and is being tested. Multimegawatt thin-film CdTe manufacturing plants are expected to be completed in 1-2 years.

561 (NREL/TP–413-5835) **Research on polycrystalline thin-film $CuInGaSe_2$ solar cells: Annual subcontract report, 3 May 1991–21 May 1993.** Chen, W.S. (Boeing Co., Seattle, WA (United States). Defense and Space Systems Group); Stewart, J.M.; Mickelsen, R.A.; Devaney, W.E.; Stanbery, B.J. National Renewable Energy Lab., Golden, CO (United States); Boeing Co., Seattle, WA (United States). Defense and Space Systems Group. Oct 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000203. Source: OSTI; NTIS; GPO Dep.

This report describes work to fabricate high-efficiency CdZnS/$CuInGaSe_2$, thin-film solar cells and to develop improved transparent conductor window layers such as ZnO. The specific technical milestone for Phase I was to demonstrate an air mass (AM) 1.5 global 13% , 1-cm^2 total-area $CuInGaSe_2$ (CIGS) thin-film solar cell. For Phase II, the objective was to demonstrate an AM1.5 global 13.5%, 1-cm^2 total-area efficiency. We focused our activities on three areas. First, we modified the CIGS deposition system to double its substrate capacity. Second, we developed new tooling to enable investigation of a modified aqueous CdZnS process in which the goal was to improve the yield of this critical step in the device fabrication process. Third, we upgraded the ZnO sputtering system to improve its reliability and reproducibility. A dual rotatable cathode metallic source was installed, and the sputtering parameters were further optimized to improve ZnO's properties as a transparent conducting oxide (TCO). Combining the refined CdZnS process with CIGS from the newly fixtured deposition system enable us to fabricate and deliver a $ZnO/Cd_{0.08}Zn_{0.20}S/CuIn_{0.74}Ga_{0.26}Se_2$ cell on alumina with I-V characteristics, as measured by NREL under standard test conditions, of 13.7% efficiency with V_{oc} = 0.5458 V, J_{sc} = 35.48 mA/cm^2, FF = 0.688, and efficiency = 14.6%.

562 (NREL/TP–413-5844) **Novel two-stage selenization methods for fabrication of thin-film CIS cells and submodules: Annual subcontract report, 25 March 1992–28 February 1993.** Basol, B.M. (International Solar Electric Technology, Inglewood, CA (United States)); Kapur, V.K.; Halani, A.; Leidholm, C. National Renewable Energy Lab., Golden, CO (United States); International Solar Electric Technology, Inglewood, CA (United States). Oct 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000220. Source: OSTI; NTIS; GPO Dep.

This is the Phase 1 Annual Technical Progress Report of a subcontract titled "Novel Two-Stage Selenization Methods for Fabrication of Thin-Film CIS Cells and Submodules." The objectives of the program are the development of a cost effective process for CIS film deposition, optimization of various layers forming the CIS solar cell and fabrication of submodules using these processes and devices. During this first phase of the program the authors have completed their 1 ft^2 size processing capabilities and added to their facilities an in-line sputtering system that can handle up to 1 ft^2 size substrates. They have optimized the sputtering conditions for the Mo contact as well as the Cu and In films. Thickness uniformity of the Cu and In layers have also been optimized by masking the magnetron cathodes to obtain a variation of 3% throughout a ft^2 substrate. Using the resulting films, they have demonstrated their

first large area CIS submodules with outputs of about 3W/ft^2. Addition of a computer controlled mechanical scriber to the fabrication facilities, and optimization of the large-area ZnO layers are expected to improve the power output of these submodules to over 5W/ft^2 shortly. In addition to the large-area submodule work, the authors have also carried out research aimed at the development of a non-vacuum processing approach for the growth of CIS layers. They have deposited films using this technique, and small-area cells with over 10% conversion efficiency have been demonstrated on such CIS layers.

563 (NREL/TP–451-5733) **Annual report, Materials Science Branch, FY 1992.** Padilla, S. (ed.). National Renewable Energy Lab., Golden, CO (United States). Oct 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000204. Source: OSTI; NTIS; GPO Dep.

This report summarizes the progress of the Materials Science Branch of the National Renewable Energy Laboratory (NREL) from October 1, 1991, through September 30, 1992. Six technical sections of the report cover these main areas of NREL's in-house research: Crystal Growth, Amorphous Silicon, III-V High-Efficiency Photovoltaic Cells, Solid State Theory, Solid State Spectroscopy, and Program Management. Each section explains the purpose and major accomplishments of the work in the context of the US Department of Energy's National Photovoltaic Research Program plans.

564 (NREL/TP–451-5755) **Polycrystalline thin film materials and devices: Final subcontract report, 16 January 1990–15 January 1993.** Birkmire, R.W. (Delaware Univ., Newark, DE (United States). Inst. of Energy Conversion); Phillips, J.E.; Shafarman, W.N.; Hegedus, S.S.; McCandless, B.E.; Yokimcus, T.A. National Renewable Energy Lab., Golden, CO (United States); Delaware Univ., Newark, DE (United States). Inst. of Energy Conversion. Aug 1993. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018213. Source: OSTI; NTIS; GPO Dep.

This report describes results and conclusions of the final phase (III) of a three-year research program on polycrystalline thin-film heterojunction solar cells. The research consisted of the investigation of the relationships between processing, materials properties, and device performance. This relationship was quantified by device modeling and analysis. The analysis of thin-film polycrystalline heterojunction solar cells explains how minority-carrier recombination at the metallurgical interface and at grain boundaries can be greatly reduced by the proper doping of the window and absorber layers. Additional analysis and measurements show that the present solar cells are limited by the magnitude of the diode current, which appears to be caused by recombination in the space charge region. Developing an efficient commercial-scale process for fabricating large-area polycrystalline, thin-film solar cells from a research process requires a detailed understanding of the individual steps in making the solar cell, and their relationship to device performance and reliability. The complexities involved in characterizing a process are demonstrated with results from our research program on $CuInSe_2$, and CdTe processes.

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565 (ETDE-IT–93-236) **Advanced energy systems applicaton for new ENEA headquarters.** Palazzi, G. (ENEA, Casaccia (Italy). Area Energetica). 1993. 4p. (CONF-930631–1: 1. international thermal energy congress, Marrakesh (Morocco), 6-10 Jun 1993). Order Number DE94716557. Source: OSTI; NTIS (US Sales Only).

ENEA (Italian Agency for Energy, New Technologies and the Environment) that has the task of carrying out R&D and demonstration activities in the field of new technology, energy and environment. The Casaccia Research Centre has the largest concentration of ENEA laboratories and is located 25 kilometers from Rome, with the possibility of moving the ENEA headquarters, at present located in the city of Rome, to the Casaccia Centre, a plan for the new building was developed. The most advanced systems for the use and saving of energy were to be employed. The proposal foresees the use of solar energy both for electrical and thermal power production. A quarter of the southern facade is to produce about 26,000 kWh by means of crystalline and amorphous cells; a solar collector should allow savings of 670 GJ. The heating and cooling systems are to incorporate heat pumps: electric with an ice accumulator for the first tower of the building, a gas heat pump with chiller for the second. The energy performance of the building the 6 story twin tower building complex was verified by the use of the TRNSYS code.

566 (ETSU-S/P–2/00131/REP) **A study of the feasibility of photovoltaic modules as a commercial building cladding component.** Lord, B. BP Solar Ltd., Leatherhead (United Kingdom). 1993. 291p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716690. Source: OSTI; NTIS (US Sales Only).

The objective of this study was to make an assessment of the technical and economic aspects of the integration of photovoltaic (PV) modules into commercial buildings. This can be broken down into the following specific objectives: to identify the costs of conventional cladding technologies; to determine the cost, present and future, of PV modules suitable for use as building cladding; to make comparisons of conventional and PV cladding; and to present conclusions and recommendations regarding the developments and use of PV technology in the UK. (author)

567 (EUR–14084) **Photovoltaic power supply for the bird and weather station on Scharhoern Island.** Commission of the European Communities, Luxembourg (Luxembourg). 1992. 109p. (In German, English). Contract SE/267/84. Source: OSTI; NTIS (US Sales Only).

The aim of the project was to commission a reliable power supply for a bird sanctuary station which would take particular consideration of the requirements in a seabird protection area. The conventional type of power supply with a diesel generator was unsuitable due to problems caused by noise, exhaust and costly maintenance. Wind generators also cause noise and have to be protected from birds in flight, and thus also pose problems. A sea cable for connection to the mains is extremely uneconomical, considering the low power requirements and the large expense in order to have control over high and low tide. The requirements put on the power supply are: (i) no disturbing noise (especially during breeding time); (ii) no exhausts (especially during breeding time); (iii) no moving parts which could be of disturbance to the birds (e.g. wind generator); (iv) unobtrusively embedded in the countryside; (v) low maintenance and easy handling; (vi) high availability and reliability, considering the restricted access to the plant because of its exposed position. An important task within this project was the development of a special base construction for the solar generator frames, taking into consideration the specific conditions on Scharhoern. The island of Scharhoern is a sand dune in the mud flats, which is washed over by the sea when there are heavy storm floods. In addition, extreme wind speeds are often measured (up to 200 km/h). (author). figs., tabs., photos., appendices.

568 (EUR–14119) **Photovoltaic power supply for groundwater-level measurement.** Commission of the European Communities, Luxembourg (Luxembourg). 1992. 77p. (In German, English). Contract SE/560/83. Source: OSTI; NTIS (US Sales Only).

The aim of the project was to test the reliability of small, self-sufficient photovoltaic systems in connection with automatic measuring equipment. A further aim was to determine whether data transfer via radio is a reliable alternative. This project was also used to test whether use of the solar generator could be minimized, taking into consideration the unfavourable sunshine conditions in Hamburg. (author). 13 photos., 3 tabs., 1 appendix.

569 (EUR–14121) **Photovoltaic equipment for 12 lodgings and huts in the French Alps.** Dufrien, J.B. (Grande Traversee des Alpes, 38 - Grenoble (France)); Marquet, C. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 62p. (In French, English). Contract SE/696/84. Source: OSTI; NTIS (US Sales Only).

The aim of this photovoltaic project is to demonstrate the reliability of small PV generators used to electrify 12 lodgings and huts located on the hiking route known as the "Grande Traversee des

Alpes (GTA)". The refuges selected are all located in a severe high mountain climate and grid connection was to be excluded due to their very isolated location. The PV-energy serves to power lighting, radios, TV, radiotelephones, refrigerators and a number of domestic equipment. The houses have been classified in three types according to the energy needs. These three types are fitted with 7 (280 Wp), 12 (480 Wp) or 15 (600 Wp) PV modules. The corresponding battery storage capacities are 12.6 KWh, 18 KWh and 22.5 KWh. All systems are dc-systems. The PV costs are approximately as high as the cost for a comparable Diesel generator, but PV does not cause any environmental pollution, needs almost no maintenance (except the batteries from time to time) and is very reliable. The operating results are very satisfactory. The overall monthly average yields of the modules vary between 0.5 and 3.9 KWh/KWp/day depending on the way of consumption of the owners. On the other hand the refuges are not opened in the winter time. (author). refs., 2 figs., 11 photo., 8 tabs.

570 (EUR–14135) **Photovoltaic equipment at the Sophia Antipolis Park.** Commission of the European Communities, Luxembourg (Luxembourg). 1992. 89p. (In French, English). Contract SE/493/86/FR. Source: OSTI; NTIS (US Sales Only).

The aims of this demonstration project on the feasibility of the use of photovoltaic materials in urban areas were: (i) to identify reliable and economically viable photovoltaic applications in an environment such as the Sophia Antipolis Technological Park. The applications identified concern public street lighting and the power supply of urban equipment and road crossing signals; (ii) to evaluate the service ability for these applications of photovoltaic systems in comparison with conventional solutions and present rules in force (street lighting); (iii) to define maintenance procedures for these materials. The innovatory features were, on the one hand, the use of photovoltaic equipment for applications generally accomplished by equipment connected to the electricity network, and, on the other hand, the concept of completely autonomous mobile equipment. (author). figs., photo., tabs.

571 (EUR–14137) **Kaw Mountain relay transmitter centre photovoltaic power supply system.** Aubert, B. (Renault Automation, 78 - Montigny-le-Bretonneux (France)); Blaesser, G.; Tournier, A. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 117p. (In French, English). Contract SE/122/85/FR. Source: OSTI; NTIS (US Sales Only).

RENAULT AUTOMATION/SERI and TELEDIFFUSION DE FRANCE, the body commissioned with the logistics and broadcasting of radio and television programmes, designed and constructed a 20 kWp Photovoltaic Generator intended to supply power to a Relay Transmitter Centre equipped with modern hardware optimized from the standpoint of energy consumption. The generator is located in a completely isolated zone at the side of a track crossing the equatorial forest in French Guyana. The project consisted of demonstrating the total autonomy and reliability of this type of generator for supplying power to facilities submitted to public service constraints. The 20 kW peak power is provided by 40 Wp modules attached to 21 photovoltaic panels, inclined at 10 deg in relation to the horizontal, and facing South. The voltage of the generator is 48 V d.c. and the storage system (giving 7 days reserve at full load) consists of stationary lead batteries. The design and construction of the battery charge regulating system took special account of the reliability of the sub-system. The facility has been operating satisfactorily for 30 months in the equatorial environment of KAW Mountain and, at first sight, this justifies its design and construction. The daily energy supply seems to have stabilized at a level 20% higher than the value retained at the time of dimensioning. Economically, this type of facility is not yet in competition with generating set systems. But it is because of its reliability and low maintenance requirements that TELEDIFFUSION DE FRANCE preferred the photovoltaic solution over thermal engine-driven generating sets. (author).

572 (EUR–14255) **Photovoltaic house supply for decentralized relief of mains supply.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 158p. (In German, English). Contract SE/412/85/DE. Source: OSTI; NTIS (US Sales Only).

The systems for photovoltaic energy conversion and decentralized mains relief have been integrated into industrially produced residences. The purpose of the project was to demonstrate the structural as well as the systems approach integration of the plants at three different locations and under varying marginal conditions. The concept consists of a solar electric power supply which is constantly synchronous with the local public mains and the consumer group (e.g. detached house). The energy is not fed into the mains but is only made available to the consumer group when the consumer supply exceeds a predefined supply level, which has been guaranteed to the supply company. In this project the integration of photovoltaic generator systems in industrially manufactured residences was shown for the first time. The innovation lies in this combination until now uncommon, but important for large-scale application. (author). 41 figs., 3 tabs., 2 appendices.

573 (EUR–14523) **PV system with gas-powered generator support in stand-alone operation.** Koethe, H.K. (Fraunhofer-Institut fuer solare Energiesysteme, Freiburg (Germany)); Roessler, E. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 93p. (In German, English). Contract SE/084/84/DE. Source: OSTI; NTIS (US Sales Only).

In the project 'PV system with gas-powered generator support in stand-alone operation', the aim was to demonstrate the operation of an autonomous system based on regenerative energy sources. This was supported by the Commission of the European Communities (DG XVII). The installation consists of a photovoltaic generator with 1.48 kWph, a storage battery with a rated capacity of 28.8 kWh, an inverter with 1.6 kW and a back-up gas-powered generator with 12 kVA. The most important characteristic of this PV system is the dimensioning for the six months of summer and the back-up operation with the supplementary generator during the six months of winter. The division of the domestic electric circuits into a 24 V direct current circuit for the lighting and a 200 V alternating circuit for machines and appliances had the aim of avoiding inefficient partial load operation. (author). 14 figs., appendices.

574 (NEDO-GET–9208) **Investigation on the chemically fixing technique of carbon dioxide utilizing solar energy.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 83p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714886. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This report describes the results of effective fixing technique of CO2 by utilizing solar energy. First of all, the investigation was directed to the technique for synthesizing ethylene, hydrocarbons and alcohol by electrochemical reduction of CO2. The power required for this process is supplied by photovoltaic power generation. Development of excellent electrode catalyst is needed because the reduction of CO2 requires a high overvoltage. It is desirable to enhance the selectivity of the reaction for specific material and improve the transport process in the electrolytic cell. Next, designing of material and reaction of photocatalysts using semiconductor electrode and semiconductor particulate was examined. A semiconductor electrode made of FeS2 is inexpensive and has a high ability of collecting solar light. In the category of photocatalysis system, a photocatalytic system in which semiconductor particles are embedded in vesicle and a photpocatalyst based on potassium niobate are noteworthy. As biosystem, the method of reducing CO2 by calcareous algae which simultaneously advances fixing and calcification of CO2 by photosynthesis is noteworthy. 129 refs., 45 figs., 20 tabs.

575 (NEDO-GET–9210-2) **Feasibility study on a CO2 global recycling system using natural energy.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 226p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714889. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A proposal has been made to solve global environmental problems and energy problems simultaneously by combining treatment of a great amount of CO2 with transportation of new energies difficult of large- scale, long-distance transportation. This system uses solar cells to produce hydrogen, which is synthesized with recovered CO2 to produce CH3OH and transported to users by tankers. Solar energy is available several thousand times as much as the currently mineable fossil fuels (=10 TW), and can handle the worldwide demand even with solar cells of 10% efficiency that are installed covering 2% to 3% of the desert area. A problem is that the production site is located very far away from demand areas, for example, 10,000 km on average from Japan, and moreover across oceans. The CO2 recycling system has problems on energy balance and material balance. The energy balance is from -60% to -75%. Accordingly, the energy base was selected at 'window of the desert' (desert adjoining the seashore), and a new type CO2 tanker was proposed. CO2 causes a carbon deficiency because the CO2 purity is less than 90%. 180 refs., 86 figs., 60 tabs.

576 (NEDO-P–9176) **Feasibility investigation on developing independent and discrete photovoltaic power generation system in Thailand.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 59p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714892. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This survey has investigated attitudes of the relevant organizations in Thailand to tackle with new energy development, and research and development trends as well as technical power in the country. The survey also included the feasibility to move research and development forward jointly with Thailand in developing independent and discrete photovoltaic power generation system technologies. The Thai Local Power Distribution Public Corporation plans to install submarine cables and build small hydraulic power plants in non-electrified villages accounting for 4% in the nation. According to economic discussions on local area electrification carried out by Thai Power Generation Public Corporation, the photovoltaic power generation is more advantageous economically than power supplied from diesel generators. A photovoltaic power generation system for charging 500-W batteries can respond sufficiently to requirement of obtaining energies required in remote villages to improve villagers' life quality. In carrying out the joint verification researches, it is necessary to recognize differences with Japan, and choose adequate opponent organizations for international cooperation. It is also desirable to educate and train personnels while performing plans, designs, operation and maintenance of practical facilities including pilot plants. 9 figs., 8 tabs.

577 (NEDO-P–9218) **Surveys on specific patterns of facility intallation of photovoltaic power generating technologies for international cooperation.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 161p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714901. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

With an objective of contributing to international introduction of photovoltaic power generation, its load patterns, device constitution, land areas, and prices were rearranged and standardized so that design standardization and efficiency improvement may be achieved, and appropriate introduction patterns may be selected from climatic conditions at various sites. Areas dealt with are Africa, Asia, Oceania, and South and Central America. The basic design consists of combination of solar cells with storage batteries for DC load, whereas inverters were added for AC load. Facility capacities were so designed that they can be calculated by assuming general load menus comprising lighting, pumps, and electric appliances, as well as load patterns. Because of non-electrified areas requiring insolation to take care of all of the annual load, minimum monthly average insolation on slopes was used to calculate solar cell capacities. While storage battery capacities will be established upon investigating climatic conditions at proposed sites, arrangements were made on selecting charge controllers that can avoid overcharging and overdischarging due to variation in insolation. A design procedure document was prepared so that basic design could be carried out efficiently. 9 figs., 22 tabs.

578 (TKK-NEMO–12) **NEMO'89.** Lund, P.H. (ed.). Helsinki Univ. of Technology, Otaniemi (Finland). 1989. 210p. (CONF-8908302–: NEMO 89: 2. national seminar on advanced energy systems, Kirkkonummi (Finland), 24 Aug 1989). Order Number DE94709703. Source: OSTI; NTIS.

NEMO Research Programme.

The second national NEMO-seminar on Advanced Energy Systems was held on August 24, 1989 in Sjoekulla in the vicinity of Helsinki. During the seminar, invited speakers were heard on some keyareas within the NEMO-programme. Also, a workshop on institutional questions of the energy system and industry strategies in the new energy technology field was arranged. The topics in the seminar were: Fuel cells and energy storage; Environment and energy in the Nordic countries; Environmental and chemical aspects of thermal energy storage in aquifers and research and development of water treatment methods; Heat storage system applications in energy production; Converting an old rock cavern oil storage into heat storage; New superconductors in magnetic energy storage; Advanced heat storage materials; Microcomputer simulation of thermohydraulic flow in porous media; Photovoltaic and hybrid system analyses: program development and performance predictions of a 30 kW PV plant; Wind resources in Finland: assessment of wind power potential and local wind resources; Wind power model connection to the production costing model; International cooperation in solar energy; Optimization of CSHPSS systems for Finnish conditions; Modelling of fuel cell and aluminium-air battery and research of the materials used in air-electrodes; Hydride heat pump and hydrogen technology; Grid-connected battery backed 30 kW photovoltaic plant; Development of a multisensor pyranometer; Data acquisition system for a 30 kW_p power plant in Finland; Wind energy research of Kemijoki Oy; Peak shaving battery plant 'FINE'; Fuel cell cogeneration plant - technical and economical feasibility study; Utilization of gas-diesel technology; Energy storages as a part of integrated power production and NAPS universal WTG/diesel hybride stand-alone power plants.

1407 Solar Thermal Power Systems

Refer also to citation(s) 565

579 (SAND–93-7084) **Investigation of thermal storage and steam generator issues.** Sandia National Labs., Albuquerque, NM (United States); Bechtel Corp., San Francisco, CA (United States). Aug 1993. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001558. Source: OSTI; NTIS; GPO Dep.

A review and evaluation of steam generator and thermal storage tank designs for commercial nitrate salt technology showed that the potential exists to procure both on a competitive basis from a number of qualified vendors. The report outlines the criteria for review and the results of the review, which was intended only to assess the feasibility of each design, not to make a comparison or select the best concept.

1409 Solar Thermal Utilization

Refer also to citation(s) 565, 903, 2866

580 (BFR-R–23-93) **Solar district heating plant: Evaluation, Falkenberg.** Schroeder, K. (Chalmers Univ. of Technology, Gothenburg (Sweden). Monitoring Center for Energy Research); Isakson, P. Swedish Council for Building Research, Stockholm (Sweden). 1993. 121p. (In Swedish). Project BFR-900601-7. Order Number DE94709820. Source: OSTI; NTIS.

In Falkenberg, Sweden, the firm Teknoterm AB has constructed a solar heating plant with short term storage. The solar heating plant consists of a solar collector array comprising 5,500 m^2 of flat liquid cooled solar collectors. Via a 720 m underground main, the solar collectors are connected to a heat store in the form of a

1,100 m^3 steel tank. This is in turn connected to the district heating plant. The measurement station at Chalmers University of Technology carried out measurements and has made an evaluation of the solar heating plant. During the three measurement years 1990, 1991 and 1992, the solar heating plant delivered, on average, 1.53 GWh annually to the district heating system. The plant worked relatively well, but a number of technical problems remain to be solved. The cost of solar energy is calculated at ca SEK 0.57 per kWh. (author) figs., tabs., 6 refs

581 (ETDE-IT–93-241) **Experimental performance of an indirect type solar fruit and vegetable dryer.** Spagna, G. (ENEA, Rotondella (Italy). Centro Ricerche Energia Trisaia - Area Energetica); Colangelo, A.; Sharma, V.K. 1992. 7p. (CONF-920923–1: 2. world renewable energy congress, Reading (United Kingdom), 13-18 Sep 1992). Order Number DE94716593. Source: OSTI; NTIS (US Sales Only); INIS.

This research paper describes the key design and performance characteristics of a solar fruit and vegetable dryer developed at ENEA (Italian Agency for Energy, New Technologies and the Environment) - CRE Trisaia. The dryer investigate consists of a plastic covered flat plate solar air collector, drying chamber, solar air collector, drying chamber, and thermally and acoustically insulated pipes joining the two. A series of experiments were conducted on typical summer days during the year 1989 while drying varicus fruits and vegetables. The limited experience gained with the solar drying system described here indicates that, in essence, the unit is structurally and functionally operative. It has well withstood the effects of wind, rain, snow, and sunshine over a period of three years. Likewise, the experimental results suggests that, even under unfavorable fall weather conditions, the unit is able to produce good quality products. Moreover, due to the low investment required the solar dryer is predestined for applications on small farms.

582 (ETSU-S–1218-P1) **Passive solar design studies. Midlands and Wales. Final design report. V. 1: Birmingham group.** Howrie, A.J.; Trollope, M. Daresbury Lab. (United Kingdom). 1993. 564p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Contract E/5A/CON/1218/1898. Order Number DE94716696. Source: OSTI; NTIS (US Sales Only).

This study concerns a group of 3-storey large housing units aimed at low income Asian families and providing rented accommodation in an inner city suburb, Sparkhill, in south-eastern Birmingham. The site was semi-derelict land originally occupied by a mixture of dwellings and garages. The scheme is designed within the context of adjacent Victorian and Edwardian terraces. Because of the passive solar dimension of the House Design Studies it has been a major principle of the planning that the majority of the habitable rooms face south. This was not possible throughout the 'L' shaped development. However only the south facing houses along Runcorn Road are used as the basis for this Design Study. (author)

583 (ETSU-S–1218-P2) **Passive solar design studies. Midlands and Wales. Final design report. V. 2: Welsh group.** Howrie, A.J.; Trollope, M. Daresbury Lab. (United Kingdom). 1993. 336p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Contract E/5A/CON/1218/1898. Order Number DE94716697. Source: OSTI; NTIS (US Sales Only).

This Design Study was originally based on a scheme for retirement housing on a site at Cardigan. Due to the slump in the property market and the consequence of low prices in the area, the quasi-client abandoned the idea of developing on this site. This decision coincided with the completion of the Scheme Design stage. The Design Consultant considered various courses of action in response to this circumstance, including alternative sites and configurations of site use. In fact, she chose to retain both the house type and the site, but decided to use the detail design stage as an academic exercise with the purpose of developing a variety of house types which could then be marketed by either the quasi-client or the practice. (author)

584 (ETSU-S–1218-P3) **Passive solar design studies. Midlands and Wales. Final design report. V. 3: Milton Keynes group.** Howrie, A.J.; Trollope, M. Daresbury Lab. (United Kingdom). 1993. 327p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Contract E/5A/CON/1218/1898. Order Number DE94716698. Source: OSTI; NTIS (US Sales Only).

This study focuses on the development of a scheme of one and two bedroom flats for a Housing Association on an infill site in Newport Pagnell, Bedfordshire. The brief was for a development of 16 to 20 flats to be built in terraced form or in a block of up to three storeys. The flats are to be let to local people on low incomes. The final Design comprised a two-storey block of 15 flats with main entrances leading from a central atrium, together with two, 2-storey blocks of two flats each located at the entrance to the site. (author)

585 (ETSU-S–1249) **Passive Solar Programme: ESP support for the Performance Assessment Service.** Hand, J.W.; Clarke, J.A. Strathclyde Univ., Glasgow (United Kingdom). Energy Simulation Research Unit. 1993. 53p. Order Number DE94706283. Source: OSTI; NTIS (US Sales Only).

In 1988 the Department of Trade and Industry initiated an expanded programme of work in the field of passive solar buildings. As part of this programme several leading design organisations were contracted to evaluate the performance of passive solar designs including non-passive reference buildings. It was stipulated that this performance analysis service (PAS) should be based on contemporary approaches to building energy modelling. In the event two simulation programs were selected: SERI-RES developed in the USA and, to enable a more rigorous treatment of design features such as atria and sunspaces, the ESP-r system (European Reference version) developed at the University of Strathclyde. In support of the use of ESP-r a PAS support service was established at the Energy Simulation Research Unit (ESRU) at the University of Strathclyde. (author)

1410 Solar Collectors and Concentrators

Refer also to citation(s) 903

586 (BFR-D–3-93) **Flat plate collectors with booster mirrors.** Perers, B. (Studsvik AB, Nykoeping (Sweden)); Joensson, B.; Karlsson, Bjoern; Farvolden, S. Swedish Council for Building Research, Stockholm (Sweden). 1993. 48p. Project BFR-900360-1. Order Number DE94709817. Source: OSTI; NTIS.

The annual performance of large high performance flat plate collector fields can be further improved by almost 70%. This can be achieved by introducing several improvements such as antireflective coatings and V-corrugated or honeycomb anticonvection devices and improved absorber properties. Booster mirrors in between the rows in a collector field will further increase the annual performance with at least 30%. This is achieved with no extra ground area requirement. Standard corrugated aluminum materials have shown surprisingly good long-term performance. (author) figs., tabs., refs

1420 Heat Storage

587 (BFR-R–3-93) **Seasonal storage in rock caverns: Evaluation of heat losses. Lyckebo, Uppsala.** Claesson, Johan (Lund Inst. of Tech., Lund (Sweden). Markvaermegruppen); Eftring, B.; Hillstroem, C.G. Swedish Council for Building Research, Stockholm (Sweden). 1993. 51p. (In Swedish). Project BFR-850832-6;BFR-900607-0. Order Number DE94709813. Source: OSTI; NTIS.

The solar heating plant at Lyckebo was constructed in order to develop, demonstrate and evaluate a large scale district heating system based on solar heat with seasonal storage in an open rock cavern. Heat losses were higher than estimated. The extra losses might be due to leakage of water via fissures from the store to the access tunnel which was used as the expansion vessel of the system. The experience gained at Lyckebo show that the thermal performance of the store is sensitive to water flows through external paths. The problem can however be overcome by a design change. (author) figs., tabs., refs

15 GEOTHERMAL ENERGY

588 (CONF-930484–) **Proceedings: "Geothermal Energy: The Environmental Responsible Energy Technology for the Nineties": Geothermal Program Review 11.** USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Geothermal Div. [1993]. 221p. Sponsored by USDOE, Washington, DC (United States). From 11. Geothermal program review: geothermal energy - the environmentally responsible energy technology for the nineties; Berkeley, CA (United States); 27-29 Apr 1993. Order Number DE94001714. Source: OSTI; NTIS; GPO Dep.

These proceedings contain papers pertaining to current research and development of geothermal energy in the USA. The seven sections of the document are: Overview, The Geysers, Exploration and Reservoir Characterization, Drilling, Energy Conversion, Advanced Systems, and Potpourri. The Overview presents current DOE energy policy and industry perspectives. Reservoir studies, injection, and seismic monitoring are reported for the geysers geothermal field. Aspects of geology, geochemistry and models of geothermal exploration are described. The Drilling section contains information on lost circulation, memory logging tools, and slim-hole drilling. Topics considered in energy conversion are efforts at NREL, condensation on turbines and geothermal materials. Advanced Systems include hot dry rock studies and Fenton Hill flow testing. The Potpourri section concludes the proceedings with reports on low-temperature resources, market analysis, brines, waste treatment biotechnology, and Bonneville Power Administration activities.

1501 Resources and Availability

Refer also to citation(s) 596

589 (DOE/FTR–93015806) **Travel to England for a joint study with the Camborne School of Mines Associates on the European Economic Community proposed deep HDR reservoir project: Foreign trip report, April 30–May 15, 1993.** Kruger, P. Stanford Univ., CA (United States). 20 May 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE93015806. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Activities at the Rosemanowes Hot Dry Rock (HDR) site in Cornwall, England are described briefly. Available date on two other European Economic Community proposed deep HDR candidate sites, Soultz-sous- Forets, France, and Bad Urach, Germany, were collected. Some pertinent papers are summarized briefly.

1502 Geology and Hydrology of Geothermal Systems

Refer also to citation(s) 588, 603, 607, 608, 2256

590 (ETDE/JP-mf–94714705) **Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.** Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper outlines mostly heat supply process of the geothermal system among technologies for evaluation of national geothermal resources. Shallow-depth magma reservoir and its periphery are paid attention to from the viewpoint not only of geothermal resources but of mineral resource and volcanic phenomenon. Recently by well drilling to the depth of 2-3 km, consolidation facies as magmatic heat source have begun to be reached and seismological study became a reliable measure to observe shallow-depth magma reservoirs. Through mechanical study on magma, a magma behavior is simulated, and through theoretical and experimental study on phase condition, interactions between magma, wall rocks and geothermal fluids have been elucidated. Concerning relations between magma and eruption, the paper reports generation and transfer of felsic magma, eruption mechanism viewed from earthquakes, role of volatile components, mechanism of phreatomagmatic explosion, etc. As to interactions with wall rocks, described are estimation of magma scale by thickness of contact metamorphic zones and formation of hydrothermal deposit. With relation to interactions with geothermal fluids, reports are made on emission of volatile matters from magma, magma viewed from the hydrothermal convective system, magma reservoirs viewed from hydrothermal system models, etc. 549 refs., 101 figs., 9 tabs.

591 (ETDE/JP-mf–94714705, pp. 7-51) **Generation and migration of felsitic magma.: Magmatrap.** Takada, R. (Geological Survey of Japan, Tsukuba (Japan)). Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes generation and migration of felsitic magma. The statement includes the following: Generating a large quantity of felsitic magma in lower crusts requires heating by high-temperature mantle as a heat source; further heating by heat conduction therefrom is difficult unless D_L (thickness of lithosphere below the Moho plane) is zero; in the case of $D_L > 0$, heating by basalt magma originated in the high-temperature mantle is required; the generated felsitic magma is believed to rise with diapir, but viscosity of the crust increases with the rise, and the rise stops at a certain depth; magma that has slipped through large cracks from magma reservoirs as diapir is trapped finally in a thick sedimentary rock bed if it exists in a shallow portion of the crust; and a large number of field observation and investigation data have been acquired that suggest that there are two locations where the magma can thus be accumulated. 143 refs., 16 figs.

592 (ETDE/JP-mf–94714705, pp. 135-158) **Estimation of size of magma chambers according to thickness of contact metamorphic aureole.** Muraoka, H.; Matsubayashi, O. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper introduces a method for estimating magma chamber size according to thickness of a contact metamorphic aureole. An algorithm was prepared to calculate heat conduction from a magma chamber with a shape of rectangular parallelopipeds stacked in the depth direction, utilizing rectangular parallelopiped models by Lachenbruch et al. The algorithm assumes that the contact metamorphic action can be explained by a heat conduction theory. A vertical distance from a biotite isograd to a boundary of intrusive rock bodies was used as a thickness of the contact metamorphic aureole. The initial temperature was set to 1050°C on a silic magma chamber as an object, adding a latent heat effect. A rotating ellipsoid was hypothesized as a magma chamber shape, whose aspect ratio changes with volume. With this hypothesis, relations among thickness of the contact metamorphic aureole, depth at top of a magma reservoir, and magma size were calculated according to two to three types of ground temperature gradients. These relationships were applied to young intrusive rock bodies in five geothermal areas, whereas a result was obtained that agrees approximately well with horizontal spreads already known on them. 49 refs., 7 figs., 2 tabs.

593 (ETDE/JP-mf–94714705, pp. 241-259) **Magma as seen from hot water convection systems.** Ishito, K. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper takes a general view to the studies that have been made up to now on making conception models for hot water systems in geothermal areas, especially on modelling geothermal reservoirs. The paper indicates that only an upper half of the ordinary hot water convection system was used as a region subjected

to the studies in numerically simulating the geothermal reservoirs, and that the relationship between the reservoir and the heat sources can be expressed as a boundary condition at the bottom surface of the region. Results of handling heat sources more specifically are presented as follows: A simulation on unusual phenomena seen in underground water in one area of the Izu-Oshima Island when the volcano on the island erupted (rise in water temperatures and simultaneous increase in salt and CO2 concentrations). The simulation was based on a model that assumes volcanic gas having been blown into aquifers from deep magma, and explains virtually the time-based changes in amounts of the above factors. Another simulation accommodating magma in the object regions that calculated sharp heating and clearance pressure rise as a result of intrusion of magma into underground aquifers. 20 refs., 15 figs.

594 (ETDE/JP-mf–94714705, pp. 263-296) **Magma reservoir as seen from geothermal system modelling.: Hohi, Sengan, and Kurikoma geothermal areas as examples.** Tamao, S. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes results of discussing the relation between geothermal system models and magma reservoirs in representative geothermal areas in Japan. Comprehensive investigations have been carried out by NEDO as the main organizer in the Hohi area lying across Oita and Kumamoto Prefectures, the Sengan area stretching over Akita and Iwate Prefectures, and the Kurikoma area in the northern part of Miyagi Prefecture. The paper presents a summary of the investigation results as to underground temperature structures based on well temperature logging data, and existence of geothermal sources as predicted from volcanic rock distribution and age values by each area. The conclusion of the investigations may be summarized as follows: The currently most active hydrothermal systems exist in inner arc sides of volcanic fronts rather than directly above them; and important roles in structuring geothermal systems are played by magma reservoirs created as a result of somewhat older Quaternary volcanic activities and new granite intrusive rock bodies, rather than by magma reservoirs created by the youngest Quaternary volcanic activities. 28 refs., 20 figs.

595 (ETDE/JP-mf–94714705, pp. 293-296) **Conceptional model of hydrothermal systems in Japan.** Takahashi, M. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes briefly a conceptional model of hydrothermal systems in Japan. Hydrothermal systems in a geothermal area may be divided into the following two types: (1) a hydrothermal system with low chemical component concentrations in geothermal fluids, and with its isotope composition resembling that of meteoric water; and (2) a hydrothermal system with high chemical component concentrations in geothermal fluids, and with its isotope composition resembling that of high-temperature volcanic gases. A proposal is made on a model to subdivide the rise and fall relation between volcanoes and hydrothermal systems into the following four steps: A first step wherein only a volcano exists, but no hydrothermal system has been developed; a second step that a volcanic system makes activities to form a hydrothermal system, but both systems are separated; a third step wherein the volcano decays and the hydrothermal system matures; and a fourth step with the volcano decayed and died out and the hydrothermal system aged. The hydrothermal systems described in (1) and (2) above may be assumed to correspond to hydrothermal systems in the second and third steps, respectively. 20 refs.

596 (LA–12606-MS) **The xerolithic geothermal ("hot dry rock") energy resource of the United States: An update.** Nunz, G.J. Los Alamos National Lab., NM (United States). Jul 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001568. Source: OSTI; NTIS; GPO Dep.

This report presents revised estimates, based upon the most current geothermal gradient data, of the xerolithic geothermal ("hot dry rock" or HDR) energy resources of the United States. State-by-state tabular listings are provided of the HDR energy resource base, the accessible resource base, and the potentially useful resource base. The latter further subdivided into components with potential for electricity generation, process heat, and space heat. Comparisons are made with present estimates of fossil fuel reserves. A full-sized geothermal gradient contour map is provided as a supplement in a pocket inside the back cover of the report.

597 (LBL–34242) **An integrated model for the origin of The Geysers geothermal field.** Truesdell, A. (Truesdell (A.), Menlo Park, CA (United States)); Walters, M.; Kennedy, M.; Lippmann, M. Lawrence Berkeley Lab., CA (United States). May 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-931042–7: Annual meeting of the Geothermal Resources Council (GRC), San Francisco, CA (United States), 10-13 Oct 1993). Order Number DE94001253. Source: OSTI; NTIS; GPO Dep.

Published information on the physical and geochemical characteristics of the Southeastern, Central and Northwestern Geysers reservoirs is examined. A model for the origin of the entire vapor-dominated geothermal system, based on its geological, geochemical and reservoir engineering characteristics, is proposed that agrees satisfactory with the observed field data.

1503 Geothermal Exploration and Exploration Technology

Refer also to citation(s) 588, 589, 594

598 (ETDE/JP-mf–94714917) **Fiscal 1990 verification and survey on geothermal exploration technology.: Development of fractured reservoir exploration method and elastic wave utilizing exploration method (development of exploration methods).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 359p. (In Japanese). Order Number DE94714917. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Experiments using elastic waves have been carried out to develop a fractured reservoir exploration method. The experiment fields were selected at the Tanna area in Shizuoka Prefecture for basic experiments, and the Hohi geothermal area for application experiments. A three-dimensional reflection method using high-accuracy reflection was proved effective basically to identify fractured structures. However, enhancing S/N ratio in beds at great depths leaves some room yet to be improved, requiring discussions on surface layer correction and residue correction. The VSP exploration was capable of detecting distinct reflection waves from boundary between lava and tuff in zero-offset VSP recording, showing good correspondence with the well logging. In the elastic wave tomography, velocity tomograms corresponded extremely well to velocity logging, proving the process capable of distinguishing lithofacies and identifying clearly distribution of lava beds. Fractures were detected distinctly on the velocity tomograms, the fractures being detected as discontinuities in lava beds and volcanic clastic rock beds. The elastic wave tomography is extremely effective for analyzing detailed structures among wells, and particularly detecting fractures. 4 refs., 95 figs., 8 tabs.

599 (ETDE/JP-mf–94714918) **Fiscal 1990 verification and survey on geothermal exploration technology.: Development of fractured reservoir exploration method and elastic wave utilizing exploration method (well drilling, well logging, well test), and comprehensive evaluation on fracturing characteristics.** New Energy and Industrial Technology Development Organization,

Tokyo (Japan). Mar 1992. 458p. (In Japanese). Order Number DE94714918. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Various well loggings, well tests, and core analyses were carried out to develop a fractured exploration method using elastic waves and evaluate comprehensively fracturing characteristics by raising the accuracy of the method. In the basic experimental field at the Tanna area in Shizuoka Prefecture, the VSP exploration was capable of identifying lithofacies, detecting several fractures. The elastic wave tomography has also detected discontinuity lines showing fractures. Groups of fractures exist in east and west to the Tanna fractures. Three fracture characteristics models are estimated in the Yutsubo area in the Hohi region. These are a fracture system in the north-west to south-east direction with long wave lengths, a fracture system in the east-west direction with medium wave lengths harmonious with active faults, and a fracture system with short wave lengths. The three-dimensional high-accuracy reflection method recognized a large number of fracture groups in beds shallower than a reciprocating travel time of 1.5 seconds (a depth of 2300 m). However, these are not distinct faults that cut through ground beds from shallow to deep points. A flooding test showed hard permeability, but neither large-scale reservoirs nor hot-water fractures. Estimated fractures using the elastic wave exploration present difference from actual hydrophysical geological structures. 33 refs., 116 figs., 37 tabs.

600 (ETDE/JP-mf–94714919) **Fiscal 1990 verification and survey on geothermal exploration technology.: Development of fractured reservoir exploration method and elastic wave utilizing exploration method (development of geothermal underground devices).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 333p. (In Japanese). Order Number DE94714919. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Underground oscillation receivers were fabricated on a trial basis to apply the VSP technology using elastic waves and tomographic technology to geothermal applications. Discussions were given also on propagation characteristics in underground seismic waves. The triaxial sensor, built-in front end preamplifier, and built-in regulator require corrections and review on heat resistance improvement, but other parts have functioned satisfactorily. Underground units were housed in a constant temperature tank and tested under normal temperature to 175°C. Frequency responses in all the channels were good, but the noise at 175°C was twice that at normal temperature. A field VSP operation test was carried out at the Tanna basin to discuss the vibration followability. Investigations were performed on underground vibration sources under elevated temperatures using newly orbital vibrators, seismic guns, sparkers, boomers, and perforating guns. However, as has been concluded in the tests carried out at the end of last year, explosives and air guns are thought most practical as hypocenters for fracture system exploration in terms of energy and frequency. However, there are a number of problems to be solved, including improvement in heat resistance and efficiency. 13 refs., 101 figs., 3 tabs.

601 (ETDE/JP-mf–94714920) **Survey for promotion of geothermal development in fiscal 1991/ground survey report. 3.: Area south to Mizuwaketoge pass.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Feb 1993. 70p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714920. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order to elucidate geothermal reservoir structures, two kinds of electric exploration were carried out using wells drilled in the area south to the Mizuwaketoge Pass. The current flowing potential method flows a current into a geothermal reservoir (electrically conductive) itself to identify the state of reserve from strain measurement on distribution of potential on the ground based on the current application. With the streaming potential method, fluid is forced to erupt or restore from and into a test well to observe natural potential based on movements of the fluid within underground cracked zones. Time-based change in the natural potential can tell time-based change in the underground movements of the fluid and apparent specific resistance. The said area, which has been subjected to thermal transformation, has as low apparent resistance as 20(ohm)/m. From results of electric logging and analysis of specific resistance model structure identified by the current flowing potential method, existence of abnormal bodies with low specific resistance of about 2(ohm)/m was inferred in the north, south and east to the area. These abnormal bodies with low specific resistance are fracture zones along the structure line linking the Noine fault and the Asono-kita fault, or fault fracture zones originated from the former fracture. These zones have a possibility of having been subjected to strong clay generating transformation. The prevalent fluid movement direction is from south to north. 9 refs., 29 figs., 3 tabs.

602 (INIS-mf–13731, pp. 176) **Radon: a tool for geothermal energy prospecting in El Salvador.** Balcazar, M. (Inst. Nal. de Investigaciones Nucleares (Mexico)); Flores, J.H.; Gonzalez, E.; Ortega, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GEOTHERMAL ENERGY/prospecting; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; PROSPECTING; MEXICO; RADON; VOLCANIC REGIONS

603 (UCRL-JC–114119) **Seismic imaging for saturation conditions at the Geysers, California.** Zucca, J.J.; Hutchings, L.J.; Kasameyer, P.W. Lawrence Livermore National Lab., CA (United States). May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931042–6: Annual meeting of the Geothermal Resources Council, San Francisco, CA (United States), 10-13 Oct 1993). Order Number DE94000388. Source: OSTI; NTIS; GPO Dep.

In-situ knowledge of saturation conditions at the Geysers is important for understanding the role of fluid injection in resource replenishment and to prospect for new drill sites. We are engaged in a three phase project to infer these properties from seismic imaging data. Phase I of the project is complete and we report on those results here. We are still collecting data on the other phases at the time of writing of this paper. Our method is to compute seismic compressional-wave velocity and attenuation images in terms of the geologic structure and fluid saturation. Our data consist of seismograms recorded from local earthquakes. Using compressional-wave arrival times, we invert for earthquake location, origin time, and velocity along a three-dimensional grid. In phase 1, to compute attenuation we used the initial pulse width of the compressional-wave. In the later phases, we intend to include attenuation parameters measured from spectral ratios and spectral matching. We find that the velocity structure correlates with known mapped geologic units, including a velocity high that is correlated with a felsite body at depth that is known from drilling. The dry steam reservoir, which is also known from drilling, is mostly correlated with low velocity. The Q (i.e. the inverse of attenuation) increases with depth from the surface to the top of the dry steam reservoir and decreases with depth within the reservoir. The decrease of Q with depth indicates that the saturation of the reservoir rock increases with depth.

1505 Economic, Industrial, and Business Aspects

Refer also to citation(s) 588

1506 Environmental Aspects

Refer also to citation(s) 588

1509 Geothermal Engineering

Refer also to citation(s) 588

604 (LA-UR–93-3134) **Geothermal energy production from hot dry rock: Operational testing at the Fenton Hill, New Mexico HDR test facility.** Duchane, D.V. Los Alamos National Lab., NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940126–1: Energy-sources technology conference and exhibition, New Orleans, LA (United States), 23-26 Jan 1994). Order Number DE93040148. Source: OSTI; NTIS; GPO Dep.

During 1992–1993, an extended operational testing program was conducted at the Fenton Hill, NM Hot Dry Rock (HDR) test facility. Approximately 100 gpm of water was circulated for a total period of about 8 months through an artificial geothermal reservoir located about 3.5 km (11,500 ft) below the surface. Hot water was continuously returned to the surface at temperatures of 180–190°C (355–375°F). Under steady-state operating conditions, the temperature of the fluid produced from the reservoir showed no measurable decline over the span of the testing. In fact, tracer evidence indicated that access to hot rock increased as flow was directed preferentially to longer and longer pathways through the reservoir as the testing proceeded. The amount of water lost in passing through the underground reservoir also declined with time, eventually reaching levels of only about 7% of the injected volume. Operating performance data verified that significantly more energy was produced than was required to run the test facility. Geochemical measurements indicated persistently low levels of dissolved solids and gases in the circulating fluid. Because the entire system was pressurized, nothing except waste heat was released to the atmosphere during the closed-loop testing. The test program provided new information with regard to thermal, hydraulic, operational and environmental issues concerned with the development of HDR geothermal energy plants. The data gathered in this test will form the basis for the development of facilities to produce and market energy from HDR on a commercial scale. This paper reviews the results of the recent HDR flow testing program in detail and discusses the next steps required to move HDR technology toward full commercial application as an economic process for producing clean energy.

605 (LBL–33727) **Development of a dual-porosity model for vapor-dominated fractured geothermal reservoirs using a semi-analytical fracture/matrix interaction term.** Zimmerman, R.W.; Hadgu, T.; Bodvarsson, G.S. Lawrence Berkeley Lab., CA (United States). Feb 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930121–5: 18. annual workshop on geothermal reservoir engineering, Stanford, CA (United States), 26-28 Jan 1993). Order Number DE94001257. Source: OSTI; NTIS; GPO Dep.

A new type of dual-porosity model is being developed to simulate two-phase flow processes in fractured geothermal reservoirs. At this time it is assumed that the liquid phase in the matrix blocks remains immobile. By utilizing the effective compressibility of a two-phase water/steam mixture in a porous rock, flow within the matrix blocks can be modeled by a single diffusion equation. This equation in turn is replaced by a non-linear ordinary differential equation that utilizes the mean pressure and mean saturation in the matrix blocks to calculate the rate of fluid flow between the matrix blocks and fractures. This equation has been incorporated into the numerical simulator TOUGH to serve as a source/sink term for computational gridblocks that represent the fracture system. The new method has been compared with solutions obtained using fully-discretized matrix blocks, on a problem involving a three-dimensional vapor-dominated reservoir containing an injection and a production well, and has been found to be quite accurate.

1520 Geothermal Data and Theory

Refer also to citation(s) 588, 590, 593, 595

606 (ETDE/JP-mf–94714705, pp. 161-177) **World's youngest exposed granite pluton.: Geological features, ages, and cooling model for Takidani granodiorite.** Harayama, S. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes the Takidani granodiorite mainly on its dating results. The granodiorite is exposed over an area of 21 km^2 In an axial area in the mountain range south to the Japanese North Alps. Its lithofacies changes from a granodiorite in a deep phase to a granite in an upper phase. Any of the lithofacies is very fresh not having been subjected to alterations, and bears no evidence of having been reheated. Four test pieces were sampled from this grandiorite, and were dated using the K-Ar method and the Pb-Sr method. The result showed a minimum value of 1.09 $\pm$ 0.03 Ma, and a maximum value of 1.93 $\pm$ 0.16 Ma. This granodiorite pluton age is the youngest among those having been reported from various parts of the world. The solidification age for this granodiorite at its shallow zone is estimated at 2.2 $\pm$ 0.3 Ma with reference to the age of pyroclastic flow deposits (about 2.4 Ma) which is assumed to have close spatial and chronological relation with the granodiorite in question. 46 refs., 3 figs., 4 tabs.

607 (ETDE/JP-mf–94714705, pp. 181-192) **Hydrothermal deposits generated by magma.** Morishita, Y. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes the relation between generation of hydrothermal deposits and magma. The paper states about shallow hydrothermal mineral vein deposits in the Kushikino area in Kagoshima Prefecture that hydrothermal water that has crystallized gangue minerals corresponds to geothermal water of meteoric water origin. The Otani deposit in Kyoto Prefecture is a deep hydrothermal tungsten quartz deposit. Mineralization in this deposit relates closely with intrusion of granodiorite. It is inferred that hot water in the initial stage of mineralization with high oxygen isotope ratio had been magma water, but when the initial high temperature period has been passed, temperatures of the mineral solution and the oxygen isotope ratio have decreased. The paper mentions additionally that there are examples of deposits indicated with contributions of magma water to hot water that has generated the mineral vein even in shallow hydrothermal deposits, and that computer simulation results have been obtained, which suggest correlation between generation of fissure systems in shallow hydrothermal deposits and thrust-up of intrusive rocks. 19 refs., 9 figs.

608 (ETDE/JP-mf–94714705, pp. 195-213) **Interactions between wall rocks around magma and hot water.** Fujimoto, K. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes interactions between wall rocks around magma and hot water. The paper discusses effects of hydrothermal environments on dynamic properties of rock minerals with respect to hydrolytic weakening (decrease in dynamic strength of a mineral under presence of water) and reaction enhanced deformation (deformation accelerated by chemical change occurring in a mineral itself). It also explains chemical reactivity of minerals under hydrothermal enviroments with respect to four types of chemical changes in minerals, factors governing mineral dissolution rates, and importance of equilibrium and non-equilibrium in main components in reactions between minerals and waters. These statements quote mainly results of indoor experiments. The paper indicates the following matters as problems to be discussed on interactions between wall rocks around intrusive rocks and hot waters: Deviation from chemical equilibrium in reactions between rocks and waters; change in permeability as a result of reactions between rocks and waters; and possibilities of hydrolytic weakening in rocks around intrusive rock bodies. 52 refs., 6 figs.

1540 Waste Management

Refer also to citation(s) 588

16 TIDAL AND WAVE POWER

1601 Resources and Availability

Refer also to citation(s) 611

1605 Environmental Aspects

609 (ETSU-T–04/00171/REP) **Experiments on the use of sound as a fish deterrent.** Turnpenny, A.W.H. (Fawley Aquatic Research Laboratories Ltd. (United Kingdom)); Thatcher, K.P.; Wood, R.; Loeffelman, P.H. Fawley Aquatic Research Labs. Ltd. (United Kingdom). 1993. 79p. Order Number DE94711474. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes a series of experimental studies into the potential use of acoustic stimuli to deter fish from water intakes at thermal and hydroelectric power stations. The aim was to enlarge the range of candidate signals for testing, and to apply these in more rigorous laboratory trials and to a wider range of estuarine and marine fish species than was possible in previous initial preliminary studies. The trials were also required to investigate the degree to which fish might become habituated to the sound signals, consequently reducing their effectiveness. The species of fish which were of interest in this study were the Atlantic salmon (Salmo salar), sea trout (Salmo trutta), the shads (Alosa fallax, A. alosa), the European eel (Anguilla anguilla), bass (Dicentrarchus labrax), herring (Clupea harengus), whiting (Merlangius merlangus) and cod (Gadus morhua). All of these species are considered to be of conservation and/or commercial importance in Britain today and are potentially vulnerable to capture by nuclear, fossil-fuelled and tidal generating stations. Based on the effectiveness of the signals observed in these trials, a properly developed and sited acoustic fish deterrent system is expected to reduce fish impingement significantly at water intakes. Field trials at an estuarine power station are recommended. (author)

610 (ETSU-TID–4114) **Variability in waterfowl distribution within hypertidal estuaries in relation to sediments.** Clark, N.A.; Evans, J.; Rehfisch, M.M.; Shepherd, M. British Trust for Ornithology, Thetford (United Kingdom). 1993. 320p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716689. Source: OSTI; NTIS (US Sales Only); INIS.

The Severn and Mersey estuaries are two of Britain's most important sites for their waterfowl populations. It is therefore critical to fully understand the likely impacts of tidal power barrages on these populations in order to predict the long-term post-barrage populations that the estuaries could support. Previous studies have enabled four years of monitoring to be carried out on both estuaries using identical methodology. These studies have shown that there is a considerable degree of consistency in the waterfowl populations in some areas, although apparently less so in other areas. Studies of sediment mobility have not been carried out in ways which enable direct comparison of changes in sediment with changes in bird populations. This latest study was planned to permit such a comparison and to provide five years of detailed counts on the Severn and four years on the Mersey on the low tide distribution of waterfowl populations. (author)

1608 Wave Energy Converters

611 (ETSU-R–72-Vol.2) **A review of wave energy. V. 2: Appendices.** Thorpe, T.W. AEA Environment and Energy, Harwell (United Kingdom). Dec 1992. 439p. Order Number DE94711478. Source: OSTI; NTIS (US Sales Only).

Final report.

This report contains a detailed technical and economic assessment of each of the representative wave energy devices included in the review of wave energy, which was commissioned by the Department of Trade and Industry in the United Kingdom. The main findings of the review have been summarised in Volume 1 of this report. The review was carried out under the guidance of the Wave Energy Steering Committee (WESC), and concentrated on characteristic types of wave energy devices for which there was sufficient information to carry out a detailed assessment. An important objective of the review was to obtain the highest degree of consensus on its findings. A report was issued to each design team detailing the findings on their concept and the teams were given the opportunity to present their views on the report to WESC. Any modifications required were then incorporated into the review. The final reports on each device have been brought together in this single volume as a set of Technical Appendices. In addition, the notes of the final meeting between each design team and WESC have been included at the end of each relevant Appendix. These indicate that agreement had been reached with each design team on nearly all the significant aspects of their devices and that several of the device teams had found the review process useful in identifying key areas where further improvements could be made to their devices. (author)

17 WIND ENERGY

Refer also to citation(s) 578

1701 Resources and Availability (Climatology)

Refer also to citation(s) 643

612 (PNL-SA–23109) **Wind energy potential in the United States.** Elliott, D.L.; Schwartz, M.N. Pacific Northwest Lab., Richland, WA (United States). Jun 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9306204–3: Project energy '93, Kansas City, MO (United States), 21-23 Jun 1993). Order Number DE94001667. Source: OSTI; NTIS; GPO Dep.

Estimates of the electricity that could potentially be generated by wind power and of the land area available for wind energy development have been calculated for the contiguous United States. The estimates are based on published wind resource data and exclude windy lands that are not suitable for development as a result of environmental and land-use considerations. Despite these exclusions, the potential electric power from wind energy is surprisingly large. Good wind areas, which cover 6% of the contiguous US land area, have the potential to supply more than one and a half times the current electricity consumption of the United States. Technology under development today will be capable of producing electricity economically from good wind sites in many regions of the country.

1703 Legislation and Regulations

Refer also to citation(s) 620

613 (ETSU-N–123, pp. No pagination) **The environmental health officer's role in the determination of wind turbine applications.** Spode, D. (North Cornwall District Council (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

An account is given from the Local Authority Environmental Health view point about the application for Deli Wind Farm, Delabole, Cornwall, UK, which was the first such application we received and was approved and is now operational. Subsequently we have approved the application for Cold Northcott, have refused two other applications and a further two are being processed. The account will indicate the practical problems faced by Environment Health Officers in assessing applications and advising the decision makers. An indication of the information which the author considers it is essential to have included in the noise section of an environmental assessment is given and suggestions are made on the type of conditions which should be attached to any planning consent

with a view to protecting occupiers of the closest dwelling, this being particularly important where the relevant separation distances give little room for error in getting the decision right. (author)

1705 Environmental Aspects

Refer also to citation(s) 613

614 (ETSU-N–123) **Wind turbine noise workshop: Proceedings.** Legerton, M. (ed.) (AEA Environment and Energy, Harwell (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. 241p. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). Order Number DE94708900. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Noise generated by wind turbines is an environmental constraint on the exploitation of wind energy. It is a major consideration when seeking planning consent for the siting of machines due to the high population density in the UK and low levels of background noise in rural areas. There is, therefore, a need to identify the sources and characteristics of noise emitted by wind turbine generators, assess the influences on the propagation of noise through the atmosphere, and provide information to both wind farm developers and planning regulators on noise levels. A one day workshop was organised to provide an opportunity for experts in the field of wind turbine noise to present the current thoughts on the subject and so allow a wide ranging discussion of particular issues of interest. This volume contains the 10 papers presented at the workshop for each of which a separate abstract has been prepared. (author)

615 (ETSU-N–123, pp. No pagination) **Applications of aero-acoustic analysis to wind turbine noise control.** Lowson, M. (Flow Solutions Ltd., Bristol (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

Wind turbine noise generation mechanisms are essentially equivalent to the aero-acoustic mechanisms of other rotors, which have been studied in depth for many years. Basic sources for the wind turbine noise radiation process are defined, and their significance assessed. From the analysis, areas of potential improvement in wind turbine noise prediction are defined. Suggestions are made for approaches to wind turbine noise control which separate the noise problems at cut-in from those at rated power. Some of these offer the possibility of noise reduction without unfavourable effects on performance. (author)

616 (ETSU-N–123, pp. No pagination) **Analysis of noise emission from the Bonus Kombi wind turbine.** Dunbabin, P. (Edinburgh Univ. (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

Part of the problem in comparing noise emission levels from wind turbines with theory is that it is difficult to know exactly which mechanism is responsible for noise in each part of the spectrum. The majority of noise measurements are made at ground level, some distance away from the machine, and generally the results are expressed as average values over many cycles of the turbine. The aim of these experiments was to address this problem, and to develop a technique for investigating each noise mechanism separately. A microphone was placed behind a rotating blade, and the output voltage sampled rapidly. We would expect to detect leading edge noise before detecting trailing edge noise, and therefore it should be possible to separate these two noise sources. More importantly, the very low frequency microphone trace can provide information about the aerodynamic conditions on the blade. A calculation to see if it is possible to deduce the bound circulation on the blade directly from the low frequency pressure fluctuation detected by the microphone is described. An accurate description of the decrease in bound circulation near the tip could be a useful input to a tip noise theory, especially if comparisons were made for tips of different shapes. The analysis technique also allows the separation of mechanical discrete frequency noise from aerodynamic broad band noise, and in the final section, the question of whether mechanical noise is radiated by the blades is addressed. (author)

617 (ETSU-N–123, pp. No pagination) **Mechanical noise from wind turbines.** Pinder, N. (Southampton Univ. (United Kingdom). ISVR (Inst. of Sound and Vibration Research) Consultancy Service). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

Community annoyance due to noise from wind turbines is often the result of noise character rather than level. Although the overall contributions from each of the two main classes of noise source, namely aerodynamic and mechanical, are often of a similar order for an untreated turbine, it is usually the mechanical sources which provide the dominant noise characteristics that may lead to annoyance. In this paper, the sources of mechanical noise are identified primarily with reference to horizontal axis wind turbines and then attention is concentrated on the rotor-shaft step-up gearbox, which is normally the top-ranking source. The major gearbox noise mechanisms and transmission paths are discussed and reference made to Noise Specifications and procedures applicable to the gearbox prior to its installation. The reduction of machinery noise is reviewed both at source and by treatment of transmission paths. (author)

618 (ETSU-N–123, pp. No pagination) **Sound power measurement and certification.** MacKinnon, A. (National Engineering Lab., East Kilbride (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

It is anticipated that there will be a substantial growth in the exploitation of renewable energy from the wind over the next few years. A major factor in this expected growth is the environmental acceptance or otherwise of wind turbines and in particular their noise characteristics. It is generally accepted within the turbine community that reliable methods of measuring and quantifying a turbine's acoustic signature are essential if this exploitation is to be realised. This paper will seek to review current practice both in the UK and further afield and will describe the development of a practical and reliable test method, which will aid the Wind Turbine Manufacturer, Developer and Planner. (author)

619 (ETSU-N–123, pp. No pagination) **Noise from wind turbines: State of the art in Denmark.** Andersen, B. (Dk-Teknik, Soeborg (Denmark)); Larsen, P. AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

Denmark has 3200 wind turbines with an installed maximum capacity of 418MW. The most important Danish research projects into wind turbine noise and the main results are listed. These date from 1983. Two comprehensive studies are currently in progress. The first is an analytical and empirical investigation of aerodynamic noise from wind turbine rotors and has so far dealt mainly with tip noise. The measurement method, using a hard board mounted microphone on the ground near the turbine, is described. Four different tip designs have been tested. Some examples of reference sound power level spectra for three of the designs are presented.

During the past two years a computerbased data acquisition system has been used for real-time determination of sound power levels. The second study, which has just commenced, is on annoyance from wind turbine noise. It will include noise measurements, masking calculations and a social survey on the perceived nuisance. (UK)

620 (ETSU-N–123, pp. No pagination) **Legal and planning framework for the control of noise emissions.** Trinick, M. (Bond Pearce, Solicitors, Plymouth (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

An examination of the statutory basis for the control of noise emissions is presented. Principal pieces of United Kingdom legislation and some advisory notes have been produced within 6 extensive appendices. The paper briefly examines the controls in other EC countries before discussing the way in which planning controls in the United Kingdom relate to the jurisdiction of the court. (author)

621 (ETSU-N–123, pp. No pagination) **Noise assessment at Carland Cross wind farm site.** Bass, J. (Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

A propagation model is necessary to predict noise levels resulting from a wind farm at nearby dwellings. These levels depend upon the site's topography and the local meteorology. The most commonly used model is that proposed by the IEA, which considers solely hemispherical spreading and air absorption. Several more detailed models exist, for example ENM (Environmental Noise Model), a proprietary software package specifically designed for the prediction of noise levels resulting from multiple noise sources in a complex environment, and CONCAWE, a model developed by the Oil Companies Study Group for the Conservation of Clean Air and Water. To assess the performance of these models a loudspeaker has been used to broadcast noise across the Carland Cross site in the UK and noise level measurements made at a number of locations. These data have been compared with predictions obtained from the IEA, ENM and CONCAWE models. Wind farm noise may have an audible tonal content in the near field. By broadcasting noise with a tonal content similar to a Windane 34 and measuring narrow band noise spectra at increasing distances from the source the audibility of the tones have been assessed using critical bandwidth analysis. The results suggest that such tones will not be audible in the far field. A brief discussion about the mechanism by which this happens is also included. (author)

622 (ETSU-N–123, pp. No pagination) **Annoyance rating of wind turbine noise.** Iredale, R. AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

Annoyance rating is important, but more important still is agreement on techniques for formulating minimal complaint criteria for design and specification purposes thus integrating noise control into the plant at the outset. A minimal complaint design criteria is suggested that finds its origin in the logic and techniques used successfully over many years for a wide range of power plant and other installations. The criterion is based on the masking of the wind turbine noise by the wind generated background noise. Satisfactory use of the criterion depends on the specification of inaudibility for the tones generated by the mechanical plant. Wind turbines generate more drive train noise than is realized and this contains many tones which tend to characterize the noise. Reduction of drive train noise would not only reduce the overall noise level but also give it a more acceptable character providing a margin against complaint in unusual circumstances of propagation. This requires very careful design of noise and vibration control in individual components. Vibration isolation between the support structures and the nacelle also requires careful attention. (UK)

623 (ETSU-N–123, pp. No pagination) **Noise impact assessment of wind farms.** Hayes, M. (Hayes-McKenzie Partnership, Southampton (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Wind turbine noise workshop: Proceedings.* 241p. Order Number DE94708900. Source: OSTI; NTIS (US Sales Only).

Each paper is followed by a record of the subsequent discussion.

The noise impact assessment of a wind farm is dependent upon a number of factors pertinent to the site. The most controversial is the selection of a criterion which is acceptable to both the developer of a site, in terms of maximising the number of turbines he may operate without fear of injunction to stop, and the local residents and Environmental Health Officer who will have to enforce any agreements. A number of British Standards exist which cover noise issues. There are, however, certain reservations about their use when applied to potential wind farm developments; some of the more relevant standards are outlined. In addition, Draft Planning Guidance notes which have recently been issued are discussed. These are intended to provide an indication to local planning authorities as to what noise levels and criteria may be acceptable when considering noise emitted by wind farms. No European standard for noise emission from wind farms exists but the legislative position in Denmark, the Netherlands, Germany and Sweden is briefly considered. It is considered that when a maximum level criterion is set it should take into account the existing background noise levels based on measurements which are taken at the most sensitive dwellings to the site. A method for calculating emitted noise levels from turbine arrays is described. (UK)

1706 Wind Energy Engineering

Refer also to citation(s) 615, 616, 617, 618, 619, 621

624 (ETSU-N–121) **Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.** McAnulty, K.F. (ed.) (AEA Environment and Energy, Harwell (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. 134p. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

Twelve presentations were made covering the following topics: load calculations; aerofoil characteristics; dynamic stall; stall induced vibrations; fluid dynamic computations. Eleven papers are included in this volume and separate abstracts have been prepared for each of them. (author)

625 (ETSU-N–121, pp. No pagination) **Load calculations on rotor blades of a wind turbine.** Bareiss, R. (Stuttgart Univ. (Germany)); Wagner, S. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

Calculating the loads on the rotor blades of a horizontal axis wind turbine is an essential task within the design process. The ROtor-Vortex-Lattice-Method ROVLM can be used to perform such calculations. The potential forces are determined by the Kutta-Joukowsky law and corrected by two-dimensional profile tables to account for viscous effects. Comparisons of measured data at the Elsam turbine with calculating using ROVLM show good agreement

for the flapping moment and rotorshaft torque. The high computational effort can be reduced using a hybrid wake model. (author)

626 (ETSU-N–121, pp. No pagination) **A feasibility study into the pressure instrumentation of a full scale stall regulated rotor blade.** Gilkes, S. (WEG Ltd, Greenford, Middlesex (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

A full-scale experiment into the behaviour of a two bladed teetered stall regulated rotor using a retrofit to the Myres Hill 1 MS3 machine in the UK (hereafter known as the Retrofit project) is required to allow effective validation of predictive codes and to aid extrapolation of the results to different rotor designs and sizes. The Retrofit project will have a conventional set of instrumentation (power, blade root bending moments, tower overturning moments, wind speed, rotor azimuth, teeter angle) which may be sufficient for inputs to the Stall Regulated Rotor Cost and Design Study. However, any unexpected behaviour of the rotor in power or teeter will be difficult to explain and its operation will not lead to a greater understanding of the stall process. A more comprehensive instrumentation system is required and this should include extensive pressure instrumentation to assist the latter. The technical problems and the approximate costs have to be examined before embarking upon the project and hence the need for this feasibility study. The Solar Energy Research Institute (SERI) of Denver Colorado have such a project with the "Combined Experiment" on a 10m diameter HAWT and have developed suitable instrumentation, data capture and analysis equipment. A cost effective experiment could be mounted in the UK by making use of SERI's expertise and data analysis capability. In addition, the special equipment and software developed for data capture from a pressure tapped blade may prove most useful. The use of SERI's equipment, software and experience was considered as a key aspect of this feasibility study. (author)

627 (ETSU-N–121, pp. No pagination) **Rotor blade profiles in practice.** Kramkowski, T. (Deutsches Windenergie-Inst., Wilhelmshaven (Germany)); Seifert, H. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics; 5. IEA symposium on the aerodynamics of wind turbines; 11 international meeting of test stations, Stuttgart (Germany); Wilhelmshaven (Germany), 3-4 Dec 1991; 2 In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

The first stage of wind to electric energy conversion occurs on the surface of the rotor blades. Small changes in profile can strongly affect blade aerodynamic properties. Today's blade manufacturers originate from ship yards, agricultural companies, aircraft manufacturers and others. Due to their varied backgrounds, there is a wide scatter in the materials and construction methods used and there are different opinions of rotor blade surface quality. Comparison of measured rotorblade profile coordinates with those of the catalogued values prove that there can be significant differences between the intended profile shapes and those actually used on wind turbines. This paper will show that there is a need to investigate existing rotor blade aerodynamic properties and evaluate the influence on energy output, noise emission and aerodynamic loads. Two rotor blades built in the same moulds, but with different manufacturing techniques showed, upon close investigation, two different resulting profiles. Calculating the aerodynamics of the different shapes using the Eppler Code and comparing the different resulting power curves showed the additional energy yield possible by paying more attention to blade quality. (author)

628 (ETSU-N–121, pp. No pagination) **Airfoil characteristics of rotating wind turbine blades.** Bruining, A. (Delft Univ. of Technology (Netherlands). Inst. for Wind Energy); Timmer, W.A. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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This paper contains a description of the experiments that are going to be conducted at the Delft University of Technology in order to get more quantitative data on the effects of rotation on the lift and drag distributions of a rotor blade. In January 1991 the 2-dimensional characteristics of the rotor blade were measured in the wind tunnel. The same blade is being used for rotating measurements on the rotor test facility. This makes possible a good comparison between the effects of rotation on the lift and drag distribution without the influence of geometrical imperfections of two different test models. Some results of the wind tunnel measurements are included. (author)

629 (ETSU-N–121, pp. No pagination) **Recent results from data analysis of dynamic stall on wind turbine blades.** Butterfield, C.P. (National Renewable Energy Lab., Golden, CO (United States)); Simms, D.; Huyer, S. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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Wind turbines are subjected to dynamic loading from a variety of different sources. Wind shear and turbulence cause time-varying inflow that results in unsteady airloads. Tower shadow, upwind turbine wakes, and yaw angles also introduce unsteady inflow to wind turbine rotors. Wind turbine designers must predict these loads accurately in order to adequately design blades, hubs, and the remaining support structure to achieve a 30-year life. Structural analysts have not been able to predict mean or dynamic loads accurately enough to predict the fatigue life of major wind turbine components with confidence. Part of the problem is due to uncertainty in the stochastic wind environment as mentioned earlier. Another important part of the problem is the lack of basic knowledge of rotary wing airfoil stall performance. There is mounting evidence that dynamic stall may be related to dynamic loads that are greater than predictions. This paper describes some results of investigations of unsteady aerodynamic loads measured on a wind turbine blade. The objective of the investigation is to understand the steady and unsteady stall behavior of wind turbine blades. (author)

630 (ETSU-N–121, pp. No pagination) **Stall induced vibrations.** Rawlinson-Smith, R. (Garrad, Hassan and Partners, Bristol (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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A set of brief statements indicates that an investigation has been carried out into why some machines and not others exhibit vibrations. The investigation involved calculations using two simplified unsteady aerodynamic models in the aeroelastic code BLADED. Comparison with two sets of measurements has shown that a time lag model gives good agreement with one set while a time delay model gives generally poor agreement. There is a qualitative difference between the calculations and the second set of measurements. Thirteen figures follow the brief text. (UK)

631 (ETSU-N–121, pp. No pagination) **Recent aerodynamic activities at Renewable Energy Systems.** Harris, A. (Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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Some recent work on the dynamic aerodynamic effects on horizontal axis wind turbines is presented. Two items are considered: (a) the dynamic inflow effect caused by the delay in wake establishment following operating condition changes, and (b) the local aerofoil dynamic effects caused by impulsive and circulatory delay. The basic aerodynamic code used is a multiple streamtube momentum method with dynamic inflow parameter based on the formulation of Pitt and Peters, and instationary aerofoil aerodynamics based on the time delay method of Leishmann and Beddoes. The Pitt and Peters formulation is only a first order method and it has been found necessary to include second order terms to obtain satisfactory accuracy. The dynamic aerofoil model relies on the time delay of the impulsive and circulatory components of the aerofoil normal force. Trailing edge separation is modelled using the Kirchoff function. The specified section normal force is fitted with the function and the tangential force derived from the normal force. The comparisons shown in the 12 figures which accompany the brief text are based on data from the Tjaereborg 2MW wind turbine. (author)

632 (ETSU-N–121, pp. No pagination) **Dynamic stall on a 19 M diameter HAWT.** Madsen, H.A. (Risoe National Lab., Roskilde (Denmark)); Paulsen, U.S. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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This set of 24 figures and 1 table is unaccompanied by text. The figures relate to the results of various rotor tests under different conditions and the table compares mean values of different parameters above and below stall, for low rpm and high rpm, for the discussion of the importance of unsteady effects. The parameters are angle of attack, relative velocity, wind speed, aerodynamic load input and response. (UK)

633 (ETSU-N–121, pp. No pagination) **Aerodynamic test program at ECN.** Schepers, J.G. (Netherlands Energy Research Foundation (ECN), Petten (Netherlands)); Spath, M.; Brand, A.J. AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

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This paper describes the aim and the scope of the aerodynamic test program that will be performed on a rotor blade of a full scale horizontal-axis wind turbine with radius 12.5 metre. (author)

634 (ETSU-N–121, pp. No pagination) **Performance methods: problems even without yaw, stall or unsteady effects.** Kuik, G. van (Stork Product Engineering, Amsterdam (Netherlands)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

This paper continues the discussion about the physics of wind turbine flow and the modeling in performance prediction methods started by Montgomery at the IEA meetings in 1988 and 1990. Montgomery's questions are summarized, problems in momentum theory are considered, changing methods in screw and wind turbine theory are outlined, some experimental/physical observations on vortices associated with helicopter blades and wind turbines are noted, and problems in vortex wake methods are summarized. (UK)

635 (ETSU-N–121, pp. No pagination) **Universal wind turbine for experiments (UNIWEX).** Braun, K. (Stuttgart Univ. (Germany)). AEA Environment and Energy, Harwell (United Kingdom). Jan 1992. (CONF-911287–: International Energy Agency (IEA) experts meeting on wind turbine aerodynamics, Stuttgart (Germany), 3-4 Dec 1991). In *Proceedings of the fifth IEA symposium on the aerodynamics of wind turbines.* 134p. Order Number DE94708901. Source: OSTI; NTIS (US Sales Only).

IEA R and D WECS experts meeting.

A short survey is given of both the test wind turbine UNIWEX and the research programme carried out under Annex XII of the Implementing Agreement on R and D WIND of the IEA. UNIWEX is a computer-controlled, two-bladed experimental wind turbine of 16 m rotor diameter installed at the "Ulrich Huetter wind test field" near Schnittlingen, Germany. The main goals of the project are the experimental study of aerodynamics, operational behaviour, load spectra and control strategies for different hub concepts, as well as the validation of computer codes. So far, seven organisations from three countries are participating. The project has two main objectives: design, construction and operation of an experimental wind turbine to investigate new configurational concepts and control algorithms; development of new numerical simulation codes for the analysis of the aero-elastic behaviour of horizontal-axis wind turbines including the verification by comparison with experiments. (author)

636 (ETSU-W–11/00342/04/01/REP) **Wind assessment at Carland Cross: Data analysis and results.** Bass, J. Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom). 1993. 48p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716705. Source: OSTI; NTIS (US Sales Only).

Wind speed monitoring has been carried out at the site of a proposed wind farm at Carland Cross, Cornwall, UK, since 12 January 1991. As detailed in this report, the mean wind speed at 30 m for the period 12 January 1991 to 30 January 1992 was 7.79 m/s. The data capture rate has been 86%. The equipment has generally worked satisfactorily. Inevitably there are gaps in the data - these are detailed in this report along with reasons for the data loss. An estimate of the long term wind speed has been obtained by correlating the measured data with that recorded by the UK Met Office at RAF St. Mawgan and predicting the wind speed which would have been measured had measurements been made at Carland Cross from 1 January 1970 to 31 December 1990 - the estimate being (8.45 $\pm$ 0.10) m/s. Annual statistical data for 15 M and 30 M height are presented. (author)

637 (ETSU-W–11/00342/04/02/REP) **Wind assessment at Mynydd Llanelidan: Data analysis and results.** Bass, J. Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom). 1993. 48p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716706. Source: OSTI; NTIS (US Sales Only).

Wind speed monitoring has been carried out at the site of a proposed wind farm at Mynydd Llanelidan in Wales since 1 February 1991. As detailed in this report, the mean wind speed at 30 m for the period 1 February 1991 to 31 January 1992 was 6.90 m/s. The data capture rate has been 87%. The equipment has generally worked satisfactorily. Inevitably there are gaps in the data - these are detailed in this report along with reasons for the data loss. An estimate of the long term wind speed has been obtained by correlating the measured data with that recorded by the UK Met Office at Trawsfynydd and predicting the wind speed which would have been measured had measurements been made at Mynydd Llanelidan from 1 January 1970 to 31 December 1990 - the estimate being (8.53 $\pm$ 0.09) m/s. However, the estimate is likely to significantly over-predict the true value, for reasons discussed. Annual statistical data for 15 M and 30 M height are presented. (author)

638 (ETSU-W–11/00342/04/REP) **Wind assessment at Coal Clough: Data analysis and results.** Bass, J. Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom). 1993. 48p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716707. Source: OSTI; NTIS (US Sales Only).

Wind speed monitoring has been carried out at the site of a proposed wind farm at Coal Clough in the United Kingdom since 7 January 1991. As detailed in this report, the mean wind speed at 30 m for the period 7 January 1991 to 31 January 1992 was 7.55 m/s. The data capture rate has been 82%. The equipment has

generally worked satisfactorily. Inevitably there are gaps in the data - these are detailed in this report along with reasons for the data loss. An estimate of the long term wind speed has been obtained by correlating the measured data with that recorded by the UK Met Office at Wilsden and predicting the wind speed which would have been measured had measurements been made at Coal Clough from 1 February 1972 to 31 December 1990 - the estimate being (8.43 ± 0.10) m/s. Annual statistical data for 15 M and 30 M height are presented. (author)

639 (ETSU-W–43/00147/REP) **Further development of a finite element code for use by the wind turbine industry.** Patel, M.; Wei, J.; Garrad, A.D. Garrad, Hassan and Partners, Bristol (United Kingdom). 1993. 84p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716693. Source: OSTI; NTIS (US Sales Only).

It is now generally accepted that the dynamic characteristics of a wind turbine must be included in any model used to predict loads. The supporting towers are becoming more flexible as designs develop and hence they also must be included in the models. Traditionally the helicopter industry, which shares many of the modelling problems encountered with wind turbines, uses a modal approach to characterise the dynamic components of the system. To include the tower and the rotor in such model creates some very tedious algebraic problems and tends to produce models that are very specific to the type of machine under investigation. The current project is the continuation of earlier work carried out on behalf of the then Department of Energy. That work was aimed at establishing the viability of using a finite element approach to compute the coupled rotor-tower aeroelastic response of a wind turbine. (author)

640 (ETSU-WN–5113) **A wind tunnel investigation of the wake structure within small wind turbine farms.** Hassan, U. Garrad, Hassan and Partners, Bristol (United Kingdom). 1993. 233p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716692. Source: OSTI; NTIS (US Sales Only).

The primary aim of the work reported here was to obtain comprehensive data on the mean and turbulent flow within wind farms of horizontal axis wind turbines. Wakes within wind farms of 15 wind turbine models have been investigated in some detail in the largest atmospheric boundary layer wind tunnel in the UK. Measurements of machine performance and loading have also been recorded. (author)

641 (ETSU-WN–6037) **'Front-end' aerodynamic control of horizontal axis wind turbines: Final report.** Anderson, C.G.; Campbell, T.J. Edinburgh Univ. (United Kingdom). Fluid Dynamics Unit. 1993. 111p. Sponsored by AEA Environment and Energy, Harwell (United Kingdom). Order Number DE94716694. Source: OSTI; NTIS (US Sales Only).

This report summarises a two-year study of the concept of 'front-end' aerodynamic control for horizontal axis wind turbines. The description covers methods of blade pitch control in which the aerodynamic turning moment of the movable section is used as an actuating torque. The technique, known as pitch compliance, is intended to enhance the power control of the wind turbine and alleviate blade cyclic loading. The concept was examined with regard to: fundamental principles, and methods of implementation; power control and blade loading characteristics; and cost implications for horizontal-axis wind turbines. (author)

642 (EUR–14458) **The demonstration of a vertical axis wind turbine on a remote island.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 93p. Contract WE/127/83/UK. Source: OSTI; NTIS (US Sales Only).

A vertical axis wind turbine (WT) with straight blades, rated at 100 kW has been installed by VAWT Ltd since October 1987 on the island of Scilly. After some modifications in the geometry of the rotor, the WT was operational within one year. The supervisory control of the WT is performed by a micro-processor-based system and many measurements concerning the mechanical behaviour of the WT have been carried out. The machine has produced very interesting results and has been well received by the inhabitants of the island, which is a holiday centre. (author). 8 refs., 45 figs., 8 tabs.

643 (EUR–14607) **R and D programme Joule, 1990-1992, in the field of non-nuclear energy and rational use of energy.** Caratti, G.; Arribas, A. (eds.). Commission of the European Communities, Luxembourg (Luxembourg). 1992. 306p. (CONF-9206413–: Proceedings Wind Energy R and D contractor Meeting, Alghero (Italy), 3-5 Jun 1992). Source: OSTI; NTIS (US Sales Only).

This report contains the papers presented at the meeting of the contractors of the research and development programme into wind energy, 1990-1992, at the Commission of the European Communities, Directorate General for Science, Research and Development. This meeting was held in Alghero, Italy, 3-5 June 1992. The papers, which have been presented by the coordinators of the 25 multi-partner projects in the Programme, summarize the status and objectives of each individual project at an intermediate stage of its progress. Some projects are the follow-up of research carried out in the previous programme 1985-1989 whereas a few have started only recently. A few projects in the programme which ended prior to the meeting are not reported. The papers are ordered according to the structure of the Programme which addresses five main research areas in wind energy, viz, wind measuring and modelling, wind turbine experiments and utilisation, development of components and models, stand-alone and offshore, large wind turbines. The duration of each contract is about two years and the total programme budget is 22 million ECU to which the Commission contributes only by about half.

644 (EUR–14753) **The 20 kW wind-diesel integrated system.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 53p. Contract WE/157/83/IT. Source: OSTI; NTIS (US Sales Only).

The supply of electric energy to isolated utilities, usually made by means of Diesel-electric generators, turns out to be very expensive, both in terms of energy and money. It is necessary, therefore, to exploit to the best the sources of energy available locally, without jeopardizing the continuity of service and the quality of the electric energy produced. For that reason Aeritalia, with the EEC support, has designed and developed a Wind-Diesel integrated system of the POSH (Power SHaring) type, having innovative features, whose 20 kW demonstrator unit has been installed and put to work in Calabria. A detailed description is given of the system and of the operating principles thereof, with special attention to the cybernetics of latching/unlatching of the various active groups in different wind/load conditions. It is furthermore described the vast testing campaign, made both on the rig and on the field, of the main components and of the integrated system, with presentation of the most significant testing results. (author).

645 (SAND–93-1375C) **A review of the workshop on fatigue life methodologies for wind turbines.** Sutherland, H.J. (Sandia National Labs., Albuquerque, NM (United States)); Butterfield, C.P. Sandia National Labs., Albuquerque, NM (United States); National Renewable Energy Lab., Golden, CO (United States); Northern Power Systems, Moretown, VT (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ;AC04-76DP00789 ;FC02-86CH10311. (CONF-940113–2: 13. Energy-sources technology conference and exhibition (ETCE) on wind energy, New Orleans, LA (United States), 23-26 Jan 1994). Order Number DE94002039. Source: OSTI; NTIS; GPO Dep.

From March 31–April 1, 1993, Sandia National Laboratories (SNL) and the National Renewable Energy Laboratory (NREL) hosted a workshop entitled "Fatigue Life Methodologies." The purpose of this workshop was to bring together a representative panel of experts to discuss the prediction and measurement of infrequent events that contribute significantly to the damage of wind turbine components. The diverse backgrounds of the participants yielded discussions that covered a wide range of research and design activities from many varying viewpoints. Consensus was not reached on most of the questions raised at the workshop; however, the workshop laid the foundation for a program that now knows what questions must be answered. This paper reviews this workshop.

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Refer also to citation(s) 9, 55, 57, 59, 131, 145, 154, 662, 671, 739, 1002, 1036, 1823

646 (DOE/MC/21023–93/C0210) **Second-generation PFBC systems research and development: Phase 2, Best efficiency approach in light of current data.** Robertson, A. (and others); Burkhard, F.; Carli, G. Foster Wheeler Development Corp., Livingston, NJ (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC21023. (CONF-9306148–46: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040921. Source: OSTI; NTIS; GPO Dep.

The low-Btu gas is produced in the carbonizer by pyrolysis/mild devolatilization of coal in a fluidized bed reactor. Because this unit operates at temperatures much lower than gasifiers currently under development, it also produces char residue. Left untreated, the fuel gas will contain hydrogen sulfide and sulfur-containing tar/light oil vapors; therefore, lime-based sorbents are injected into the carbonizer to catalytically enhance tar cracking and to capture sulfur as calcium sulfide. Sulfur is captured in situ, and the raw fuel gas is fired hot. Thus expensive, complex, fuel gas heat exchangers and chemical or sulfur-capturing bed cleanup systems that are part of the coal gasification combined-cycle plants now being developed are eliminated. The char and calcium sulfide produced in the carbonizer and contained in the fuel gas as elutriated particles are captured by high-temperature filters, rendering the fuel gas essentially particulate-free and able to meet New Source Performance Standards (NSPS). The captured material, with carbonizer bed drains, is collected in a central hopper and injected into the CPFBC through a nitrogen-aerated non-mechanical valve. The high excess air in the combustor transforms the calcium sulfide to sulfate, allowing its disposal with the normal CPFBC spent sorbent. In the CPFBC, the burning char heats the high-excess-air flue gas to 1600°F; any surplus heat is transferred to the FBHE by the recirculation of solids (sorbent and coal fly ash) between the two units. Controlled recirculation is accomplished with cyclone separators and non-mechanical valves. The FBHE contains tube surfaces that cool the circulating solids. Because of the low fluidizing velocity in the FBHE ($\leq$ 1/2 ft/s), the risk of tube erosion is virtually eliminated.

647 (DOE/MC/21023–93/C0211) **Second-generation PFBC systems research and development, Phase 2 topping combustor development.** Domeracki, W.F.; Dowdy, T.E.; Bachovchin, D.; Foote, J.; Pillsbury, P.W.; Bouvier, B.U.; Muller, K.F. Westinghouse Electric Corp., Orlando, FL (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC21023. (CONF-9306148–48: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040922. Source: OSTI; NTIS; GPO Dep.

The use of a Circulating Pressurized Fluidized Bed Combustor (CPFBC) as the primary combustion system for a combustion turbine requires transporting compressor air to the CPFBC and vitiated air/fuel gas back to the turbine. In addition, the topping combustion system must be located in the returning vitiated airflow path. The conventional fuel system and turbine center section require major changes for the applications. The combustion zone of the Westinghouse 501F turbine currently in production cannot contain the topping combustion system within the main structural pressure shell. Although the pressure casing can be enlarged both radially and longitudinally to accommodate the topping combustor system, the integrity and rigidity of the main shell would be significantly affected and, it could introduce rotor dynamics problems and preclude shipping the unit assembled. The currently favored configuration, which utilizes two topping combustor assemblies, one on each side of the unit, is shown in Figure 1. Half of the vitiated air from the CPFBC enters each of the internal plenum chambers in which the topping combustors are mounted. Fuel gas enters the assembly via the fuel nozzles at the head end of the combustor. Combustion occurs, and the products of combustion are ducted into the main shell for distribution to the first-stage turbine vanes. Compressor discharge air leaves the main shell, flowing around the annular duct into adjacent combustion shells. The air flows around the vitiated air plenums and leaves each combustion assembly via nozzles and is ducted to the CPFBC and carbonizer.

648 (DOE/MC/23166–3414) **Advanced Turbine Systems (ATS): Phase 1 system scoping and feasibility studies.** White, D.J. Caterpillar, Inc., San Diego, CA (United States). Solar Turbines. 15 Apr 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC23166. (SR–93-R-5278-115). Order Number DE93041130. Source: OSTI; NTIS; GPO Dep.

As part of this involvement Solar intends to design and commercialize a unique gas turbine system that promises high cycle efficiencies and low exhaust emissions. This engine of approximately 12-MW will be targeted for the dispersed power markets both urban and rural. Goals of 50% thermal efficiency and 8 parts-per-million by volume (ppmv) nitrogen oxide emissions were established. Reliability, availability, and maintainability (RAM) will continue to be the most important factors in the competitive marketplace. The other major goal adopted was one of reducing the cost of power produced by 10%. This reduction is based on the cost of power (COP) associated with today's engines that lie in the same horsepower range as that targeted in this study. An advanced cycle based on an approximation of the Ericsson Cycle was adopted after careful studies of a number of different cycles. This advanced intercooled, recuperated engine when fired at 2450°F will be capable of meeting the 50% efficiency goal if the cooling air requirements do not exceed 7% of the total air flow rate. This latter qualification will probably dictate the use of ceramic parts for both the nozzle guide vanes and the turbine blades. Cooling of these parts will probably be required and the 7% cooling flow allowance is thought to be adequate for such materials. Analyses of the cost of power and RAM goals show that the installed cost of this advanced engine can be approximately 50% above today's costs. This cost is based on $4.00 per million Btu fuel and a COP reduction of 10% while maintaining the same RAM as today's engines.

649 (DOE/MC/23170–93/C0228) **Combustion tests of a turbine simulator burning low Btu fuel and a rich-quench-lean combustor.** Cook, C.S.; Abuaf, N.; Feitelberg, A.S.; Hung, S.L.; Najewicz, D.J.; Samuels, M.S. General Electric Environmental Services, Inc., Lebanon, PA (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC23170. (CONF-9306148–26: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019860. Source: OSTI; NTIS; GPO Dep.

The integrated gasification combined cycle (IGCC) concept represents a highly efficient and environmentally compatible advanced coal fueled power generation technology. When IGCC is coupled with high temperature desulfurization, or hot gas cleanup (HGCU), the efficiency and cost advantage of IGCC is further improved with respect to systems based on conventional low temperature gas cleanup. Commercialization of the IGCC/HGCU concept requires successful development of combustion systems for high temperature low Btu fuel in gas turbines. Toward this goal, a turbine combustion system simulator has been designed, constructed, and fired with high temperature low Btu fuel. Fuel is supplied by a pilot scale fixed bed gasifier and hot gas desulfurization system. The primary objectives of this project are: (1) demonstration of long term operability of the turbine simulator with high temperature low Btu fuel; (2) characterization of particulates in the fuel as well as deposits in the fuel nozzle, combustor, and first stage nozzle; and (3) measurement of NO_x, CO, and particulate emissions. In a related project, a reduced scale rich-quench-lean (RQL) gas turbine combustor has been designed, constructed, and fired with simulated low Btu fuel. The overall objective of this work is to develop an RQL combustor with lower conversion of fuel bound nitrogen (FBN) to NO_x than a conventional combustor.

650 (DOE/MC/25177–3307) **Clean coal reference plants: Atmospheric CFB: Topical report, Task 1.** Rubow, L.N.; Harvey, L.E.; Buchanan, T.L.; Carpenter, R.G.; Hyre, M.R.; Zaharchuk, R. Gilbert/Commonwealth, Inc., Reading, PA (United States). Jun

1992. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC25177. Order Number DE93000251. Source: OSTI; NTIS; GPO Dep.

The Clean Coal Technology Demonstration Program is a government and industry cofunded technology development effort to demonstrate a new generation of innovative coal utilization processes in a series of full-scale facilities. The goal of the program is to provide the US energy marketplace with a number of advanced, more efficient and environmentally responsive coal-using technologies. The Morgantown Energy Technology Center (METC) has the responsibility for monitoring the CCT Projects within certain technology categories, which correspond to the center's areas of technology development, including atmospheric fluidized bed combustion, pressurized fluidized bed combustion, integrated gasification combined cycle, mild gasification, and industrial applications. A measure of success in the CCT program will be the commercial acceptance of the new technologies being demonstrated. The dissemination of project information to potential users is being accomplished by producing a series of reference plant designs which will provide the users a basis for the selection of technologies applicable to their future energy requirements. As a part of DOE's monitoring and evaluation of the CCT Projects, Gilbert/Commonwealth (G/C) has been contracted to assist in this effort by producing the design of a commercial size Reference Plant, utilizing technologies developed in the CCT Program. This report, the first in a series, describes the design of a 400 MW electric power plant, utilizing an atmospheric pressure, circulating fluidized bed combustor (ACFB) similar to the one which was demonstrated at Colorado-Ute's Nucla station, funded in Round 1 of the CCT Program. The intent of the reference plant design effort was to portray a commercial power plant with attributes considered important to the utility industry. The logical choice for the ACFB combustor was Pyropower since they supplied the ACFB for the Nucla Project.

651 (DOE/MC/26288–93/C0223) **Particle collection enhancement by acoustics.** Mansour, M.N. (Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)); Chandran, R.R.; Duqum, J.N.; Scaroni, A.W.; Koopman, G.H.; Loth, J.L. Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26288. (CONF-9306148–41: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040378. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to demonstrate pulse combustion induced acoustic enhancement of coal ash agglomeration and sulfur capture efficiency at conditions typical of proposed direct coal-fired turbines. The MTCI proprietary approach results in agglomerates that allow the use of conventional cyclones to achieve very high particulate collection efficiency and eliminates the need for barrier filters which pose concerns regarding durability and economics. The goal of the program is to support the mission of the Department of Energy (DOE) for developing coal-fired combustion gas turbines. The MTCI concept can be packaged either as a hot flue gas clean-up subsystem for the existing combustor island configurations or as an alterative primary pulse combustor island with integrated sulfur capture, particulate agglomeration and capture, alkali gettering and NO_x emissions control.

652 (DOE/MC/26308–3466) **Combustion Engineering Integrated Gasification Combined Cycle (IGCC) Repowering Project – Clean Coal II Project: Annual report, November 20, 1990–December 31, 1991.** ABB/Combustion Engineering, Inc., Windsor, CT (United States). Mar 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94000005. Source: OSTI; NTIS; GPO Dep.

The IGCC system will consist of CE's air-blown, entrained-flow, two-stage, pressurized coal gasifier; an advanced hot gas cleanup process; a combustion turbine adapted to use low-Btu coal gas; and all necessary coal handling equipment. The IGCC will include CE's slogging, entrained-flow, gasifier operating in a pressurized mode and using air as the oxidant. The hot gas will be cleaned of particulate matter (char) which is recycled back to the gasifier. After particulate removal, the product gas will be cleaned of sulfur prior to burning in a gas turbine. The proposed project includes design and demonstration of two advanced hot gas cleanup processes for removal of sulfur from the product gas of the gasifier. The primary sulfur removal method features a newly developed moving-bed zinc ferrite system downstream of the gasifier. The process data from these pilot tests is expected to be sufficient for the design of a full-scale system to be used in the proposed demonstration. A second complementary process is in situ desulfurization achieved by adding limestone or dolomite directly to the coal feed. The benefit, should such an approach prove viable, is that the downstream cleanup system could be reduced in size. In this plant, the gasifier will be producing a low-Btu gas (LBG). The LBG will be used as fuel in a standard GE gas turbine to produce power. This gas turbine will have the capability to fire LBG and natural gas (for start-up). Since firing LBG uses less air than natural gas, the gas turbine air compressor will have extra capacity. This extra compressed air will be used to pressurize the gasifier and supply the air needed in the gasification process. The plant is made of three major blocks of equipment as shown in Figure 2. They are the fuel gas island which includes the gasifier and gas cleanup, gas turbine power block, and the steam turbine block which includes the steam turbine and the HRSG.

653 (DOE/METC/C–93/7097) **Performance calculations and research direction for a water enhanced regenerative gas turbine cycle.** Rogers, L.H. (USDOE Morgantown Energy Technology Center, WV (United States)); Archer, D.H. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). (CONF-930804–18: 28. intersociety energy conversion engineering conference, Atlanta, GA (United States), 8-13 Aug 1993). Order Number DE93019866. Source: OSTI; NTIS; GPO Dep.

A cycle has been conceived that combines compressor cooling, humidification, and regenerative air heating with the added enhancement of direct injection of water into the air flow. In this cycle it is proposed that a fine mist of water be injected into the compressor air stream and a spray or film of water into the regenerator air stream. Water injection into the compressor air flow realizes several benefits: it cools the air flow, reducing the power required for compression and increasing the potential for exhaust heat recovery; it adds mass to the air stream, increasing the power produced by expansion; and it reduces the amount of cooling bleed air required by increasing the specific heat and decreasing the temperature of the cooling air stream. The greatest benefit would be derived from spraying a fine mist of water directly into the existing air flow into or before the compressor so that cooling and compression would occur simultaneously. This may be accomplished by entraining the water droplets in the inlet air flow or by introducing the water in stages during compression. An alternative and less technically challenging approach is to extract the air stream to a saturation chamber and then reintroduce the air stream into the compressor. This approach is not as desirable because it would increase the equipment cost and add a significant pressure drop penalty. The second use of water in this cycle is in water-assisted regeneration.

654 (ETDE-IT–93-229) **Gas-steam combined cycles for power generation: Current state-of-the-art and future prospects.** Macchi, E. (Politecnico di Milano, Milan (Italy)); Chiesa, P.; Consonni, S.; Lozza, G. 1992. 23p. (In Italian). (CONF-9211224–24: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716537. Source: OSTI; NTIS (US Sales Only); INIS.

The first part of this paper points out the many factors which, after years of stagnation in the electric power industry, are giving rise to a true revolution in power generation engineering: the passing from closed cycles, using steam as the working fluid and energy sources external to the power cycle, to the use of open cycles, in which the primary energy source, in the form of a fuel, is directly immersed in the working fluid of the engine. Attention is given to the advantages in terms of energy and cost savings, greater flexibility in energy policy options and pollution abatement which are now being afforded through the use of gas turbines with combined

gas-steam cycles. The second part of the paper deals with an assessment of the current state-of-the-art of the technology relative to these innovative power systems. The assessment is followed by a review of foreseen developments in combined cycle system design, choice of construction materials, type of cooling systems, operating temperatures and performance capabilities.

655 (ETDE-IT–93-230) **Fossil fuel power plant retrofitting with combined cycle gas turbine systems: Experience at EDISON (Ferruzzi Montedison Group, Italy).** Cavazzana, B. 1992. 34p. (In Italian). (CONF-9211224–23: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716538. Source: OSTI; NTIS (US Sales Only).

In response to Italy's ever increasing power demand, national energy diversification policies and stringent environmental protection regulations, the EDISON Company has undertaken a development program aimed at the rational use of relatively low cost and readily available natural gas for the production of electrical energy. EDISON's objectives include: the revamping of operational hydroelectric plants; environmental restoration of the site of the repowered Porto Marghera power station; the development, for the requirements of the Ferruzzi Montedison Group, of new high efficiency-low environmental impact power plants featuring combined cycles and cogeneration; the increased production of natural gas to contribute, to supplies transported via the national and EDISON Gas pipeline networks, to the the feeding of the new power plants' gas turbine units. This paper briefly outlines the main features of the retrofitting work that has been carried out at the two unit 320 MW power - 180 tonnes/h steam or 270 MW - 400 tonnes/h steam Porto Marghera power installation. The main features of the gas turbine/combined cycle power plant serving the Ferruzzi Montedison Group's Rovigo (Italy) corn starch production facility are also described.

656 (ETDE-IT–93-232) **Gasification and combined cycles: Present situation and future prospects.** Brustia, G.F.; Bressan, L.; Domenichini, R. 1992. 12p. (In Italian). (CONF-9211224–21: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716540. Source: OSTI; NTIS (US Sales Only); INIS.

The gasification of coal and/or residual fuels from refineries together with the use of combined cycle power generation systems represents a technically and economically feasible method for the conversion of poor quality fossil fuels into electric power. The conversion is accomplished with maximum respect for the severest environmental normatives. In addition, foreseen technical improvements for components and plant systems are expected to heighten the marketing potential of gasification/combined cycle power plants. After Italy's moratorium on nuclear energy, the passing eras of conventional fossil fuel and then combined cycle power plants, the need for highly competitive industrial production technologies and the urgency of nation-wide energy conservation appear to be ushering in the new era of gasification with combined cycles.

657 (ETDE-IT–93-233) **Combined cycles and cogeneration with natural gas and alternative fuels.** Gusso, R. (Turbotecnica SpA, Florence (Italy)). 1992. 36p. (In Italian). (CONF-9211224–20: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716541. Source: OSTI; NTIS (US Sales Only); INIS.

Since 1985 there has been a sharp increase world-wide in the sales of gas turbines. The main reasons for this are: the improved designs allowing better gas turbine and, thus, combined cycle efficiencies; the good fuel use indices in the the case of cogeneration; the versatility of the gas turbines even with poly-fuel plants; greatly limited exhaust emissions; and lower manufacturing costs and delivery times with respect to conventional plants. This paper after a brief discussion on the evolution in gas turbine applications in the world and in Italy, assesses their use and environmental impacts with fuels other than natural gas. The paper then reviews Italian efforts to develop power plants incorporating combined cycles and the gasification of coal, residual, and other low calorific value fuels.

658 (ETDE/JP-mf–94714745, pp. 1-3) **Improvement of cleaning method for heat exchanger of No.1 recovery boiler.** 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

The fluid circulating through the smoke exhaust/desulfurizer is heated by the exhaust gas from the boiler. In order to effectively utilize this heat, heat exchanger is used to make hot water to be supplied to the pulp manufacturing section. However, development of slime causes lowered recovery rate of hot water. Although the heat exchanger is usually disassembled to clean it, this method requires time and cost and the manufacture of hot water is stopped, thereby causing heat loss to be increased. An easy cleaning method has been developed to solve this problem. Sufficient amount of NaOH was added to the circulating fluid side so as to increase pH. The method to add NaOH to the circulating fluid side can be done by remote control and all the amount of NaOH can be recovered. Consequently, the recovered calorie was increased when heat exchanger was used. In addition,cost was reduced due to decreased frequency of heat exchanger disassembling/cleaning. The merit brought these measures was estimated to be 16.4 million yen/year. 1 fig.

659 (EUR–14746) **Combined heat and power plant in Hundested (Denmark).** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 27p. Contract EE/378/87/DK. Source: OSTI; NTIS (US Sales Only).

The aim of the project was to establish a flexible and efficient decentralized combined heat and power (CHP) plant and to obtain experience for implementing similar small-scale plants in other communities. The CHP plant has been under construction for the past two years and is located in a community at Hundested, Zealand. The plant is supplying heat to an existing district heating network owned by the consumers. The electricity generated at the plant is sold and delivered to EFFO, the local public power company. The plant consists of the following main systems: 1. a medium speed four-stroke engine with direct heat recovery for district heating; 2. a heat pump for utilization of low-temperature cooling ; 3. heat-storage facilities for storing heat for delivery within 24 hours ; and 4. two natural gas-fired boilers for peak-load capacity. The gas-fired boilers are also installed as stand-by boilers in order to avoid any interruption in the heat supply to the district-heating network. (author).

660 (WAPD-T–2942) **Thermal hydraulics of steam generator sludge.** Ulke, A. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-910739–30: 28. American Society of Mechanical Engineers (ASME) national heat transfer conference, Minneapolis, MN (United States), 26-31 Jul 1991). Order Number DE94002344. Source: OSTI; NTIS; GPO Dep.

The sludge deposits on top of the tubesheet in commercial steam generators create regions of high susceptibility to tube corrosion. It is believed that the corrosion occurs when the sludge deposit becomes too deep for the liquid to penetrate freely. This leads to liquid deficient regions with high chemical concentrations on the tube surface. A one-dimensional model of two-phase flow in porous media has been developed. The model considers a slab of porous medium on a horizontal non-porous surface, both under water. Heat is transferred from a vertical surface. The vapor, which is generated, flows vertically upward and the liquid is replinished by a counterflow. Under steady state conditions the mass flow rate of liquid equals that of vapor at every point along the flow path. The solution requires a minimum of five equations; continuity and momentum for the liquid and the vapor phases and energy. The momentum equations are extensions of the Darcy equation to the inertial flow regime in porous media. All five equations can be described as first order differential equations. They can be integrated with respect to distance into the sludge pile using the appropriate boundary conditions at the top of the porous slab and the transition point to "dryout" or at the bottom of the slab whichever comes first. The conservation of chemical species can be easily incorporated into the above system of equations. A FORTRAN computer program was developed to solve the above set of equations. The solution yields the distribution of the liquid and the vapor velocities and pressures, the heat flux, the liquid saturation and the chemical concentration.

661 (WAPD-T–2943) **Thermal hydraulics of steam generator sludge.** Ulke, A.; Goldberg, I. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-900608–58: American Nuclear Society (ANS) annual meeting, Nashville, TN (United States), 10-14 Jun 1990). Order Number DE94002343. Source: OSTI; NTIS; GPO Dep.

Experimental and analytical studies of thermal hydraulic processes in commercial steam generator tube sheet sludge have been previously reported. That work was performed because the authors believed that tubing corrosion occurs when the sludge deposit becomes too deep for the liquid to penetrate freely, leading to formation of a liquid deficient region with high chemical concentrations on the tube surface. The primary objective of this work is to determine analytically the extent of liquid penetration into porous sludge. The secondary objectives are determinations of liquid saturation and chemical concentration profiles along the sludge covered tube length. The method described in this paper differs from those used in previous works in that it allows specification of porosity and permeability as a function of distance into the sludge and, also, in some of the auxiliary equations used.

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Refer also to citation(s) 50, 651, 655, 657

662 (DOE/MC/21023–93/C0212) **Specific filter designs for PFBC.** Lippert, T.E.; Bruck, G.J.; Newby, R.A.; Smeltzer, E.E. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC21023 ;FC21-89MC26042. (CONF-9306148–45: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040923. Source: OSTI; NTIS; GPO Dep.

Bubbling bed PFBC technology is currently being demonstrated at commercial scale. Economic and performance improvements in these first generation type PFBC plants can be realized with the application of hot gas particulate filters. Both the secondary cyclone(s) and stack gas ESP(s) could be eliminated saving costs and providing lower system pressure losses. The cleaner gas (basically ash free) provided with the hot gas filter, also permits a wider selection of gas turbines with potentially higher performance. For these bubbling bed PFBC applications, the hot gas filter must operate at temperatures of 1580°F and system pressures of 175 psia (conditions typical of the Tidd PFBC plant). Inlet dust loadings to the filter are estimated to be about 500 to 1000 ppm with mass mean particle diameters ranging from 1.5 to 3 μm. For commercial applications typical of the 70 MW_e Tidd PFBC demonstration unit, the filter must treat up to 56,600 acfm of gas flow. Scaleup of this design to about 320 MW_e would require filtering over 160,000 acfm gas flow. For these commercial scale systems, multiple filter vessels are required. Thus, the filter design should be modular for scaling. An alternative to the bubbling bed PFBC is the circulating bed concept. In this process the hot gas filter will in general be exposed to higher operating temperatures (1650°F) and significantly higher (factor of 10 or more) particle loading.

663 (DOE/MC/24257–93/C0216) **Integrated Low Emissions Cleanup system for multi-contaminant control.** Newby, R.A.; Alvin, M.A.; Bachovchin, D.M.; Smeltzer, E.E. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24257. (CONF-9306148–43: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040373. Source: OSTI; NTIS; GPO Dep.

An existing, natural gas-fired, bench-scale, high-pressure, high-temperature test facility, previously operated by W-STC for the development of ceramic barrier filters at simulated PFBC conditions using reinjected PFBC fly ashes, was modified to study ILEC performance under simulated PFBC conditions using simultaneously natural gas and coal firing. The system was also upgraded to operate at temperatures up to about 1800°F. The objective of the bench-scale simulation is to produce a gas having pressure, temperature, gas composition (SO_2, alkali content, and particulate content), and fly ash particulate characteristics similar to actual coal-fired PFBC, or other coal combustors. Temperatures ranging from 1300°F to about 1750°F will be considered. The test facility will be operated to produce a gas volumetric flow of about 80 acfm, at 100 psig pressure, and will fire coal being from 5 to 40 % of the total energy input, the remainder being natural gas.

664 (DOE/MC/25034–93/C0231) **Evaluation of ceramic filter material, selection for application.** Alvin, M.A. (Pennsylvania State Univ., University Park, PA (United States)); Tressler, R.E.; Lippert, T.E.; Diaz, E.S. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC25034. (CONF-9306148–21: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019874. Source: OSTI; NTIS; GPO Dep.

Field testing in several of the Westinghouse Advanced Particulate Filtration (APF) systems has indicated that the oxide-based materials are more susceptible to thermal shock which results from system transients (i.e., combustion of char or reducing gases; system startup/turbine transients). The current clay bonded silicon carbide filter materials have a higher thermal shock resistance, but appear to be more susceptible to high temperature creep, as well as to changes that occur within the binder phase(s). Strength has frequently been used to assess what effects advanced coal fired process systems have on the stability and projected life of the various porous ceramic filter materials (Tables 1 and 2). Based on the numerous phase changes that occur, and the influence of pulse cleaning on the thermal fatigue characteristics of both the alumina/mullite and clay bonded silicon carbide filter materials, alternate material properties as thermal conductivity, thermal coefficient of expansion, elastic modulus, fracture toughness, and emissivity as a function of thermal/chemical aging are now being considered as critical factors for projecting filter durability and operating life. Table 3 provides a summary of the as-manufactured material properties for the alumina/mullite and clay bonded silicon carbide filter materials which have been used in the Westinghouse's APF systems. Effort is currently being directed to determine how these properties change during thermal aging of the filters in various subpilot and pilot plant systems.

665 (DOE/MC/25140–93/C0224) **Particulate characterization for PFBC filter systems.** Pontius, D.H. Southern Co. Services, Inc., Birmingham, AL (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC25140. (CONF-9306148–47: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040919. Source: OSTI; NTIS; GPO Dep.

Southern Research Institute is participating, as a subcontractor to Southern Company Services (SCS), in METC's project to establish a Power Systems Development Facility at Wilsonville, Alabama. This plant will serve as a facility for the development and testing of advanced systems for coal-based power generation. An important part of the program will be to test and evaluate various kinds of particulate control devices and systems for operation at high temperatures and high pressures. The hot gas cleanup technology is a critical factor in achieving the highest levels of energy efficiency in the advanced power systems. In connection with evaluation of particulate control devices to be installed at this facility, SRI has the responsibility for developing methods and equipment to characterize the particulate material suspended in the hot gas streams. Our objectives are to design systems for sampling and monitoring particulate mass loadings and size distributions at appropriate locations in the plant and to develop methods for operating these systems. We will assist SCS in the preparation of test plans for the operation of the plant, and we will participate in carrying out the particulate measurements.

666 (DOE/MC/26042–93/C0213) **Initial operation of the Tidd PFBC hot gas clean up filter.** Mudd, M.J.; Hoffman, J.D. American Electric Power Service Corp., Columbus, OH (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract FC21-89MC26042. (CONF-9306148–36: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040376. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to evaluate the design and obtain operating experience for up to two Advanced Particle Filter (APF) systems through long-term testing on a slipstream at Ohio Power Company's Tidd PFBC Demonstration Plant. Performance and reliability of commercial-scale filter modules will be monitored to aid in an assessment of the readiness and economic viability of this technology for commercial PFBC applications.

667 (DOE/MC/27423–93/C0215) **Applications of moving granular-bed filters to advanced systems.** Wilson, K.W.; Haas, J.C.; Eshelman, M.B. Combustion Power Co., Inc., Menlo Park, CA (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27423. (CONF-9306148–42: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93040374. Source: OSTI; NTIS; GPO Dep.

The contract is arranged as a base contract with three options. The objective of the base contract is to develop conceptual design(s) of moving granular bed filter and ceramic candle filter technology for control of particles from integrated gasification combined cycle (IGCC) systems, pressurized fluidized-bed combustors (PFBC), and direct coal fueled turbine (DCFT) environments. The conceptual design(s) of these filter technologies are compared, primarily from an economic perspective. The granular bed filter was developed through low pressure, high temperature (1600°F) testing in the late 1970's and early 1980's. Collection efficiencies over 99% were obtained. In 1988, high pressure, high temperature testing was completed at New York University, Westbury, N.Y., utilizing a two advanced power generating plants were chosen for developing conceptual designs and cost estimates of the commercial sized filters. One is the 450 MWe, second generation pressurized fluidized bed combustion plant defined by Foster Wheeler. This plant originally included cross-flow filters for hot gas cleanup. The other plant under study is a 100 MWe, KRW air blown gasifier. A cross-flow filter was utilized for gas stream cleanup in this study also. Granular bed and ceramic candle filters were substituted for the cross-flow filters in both these plants, and the resulting costs were compared.

668 (DOE/METC/C–93/7092) **Effects of operating conditions on dust cake behavior in filters with high surface-to-volume ratios.** Chiang, Ta-Kuan; Dennis, R.A. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). (CONF-9306148–10: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019738. Source: OSTI; NTIS; GPO Dep.

Generally, new filter elements with large S/V ratios typically have inlet passages with a small cross sectional area to reach a large filter surface area internal to the filter element. To prevent plugging of the inlet passages, or to prevent the filter passage inlet velocity from becoming dangerously high causing cake disturbance, the high S/V filter can only accommodate a very thin cake. The conventional backpulse cleaning technique may not be able to dislodge this thin cake. The multi-tier design using ceramic candles can tolerate a thick dust cake. The conventional back-pulse cleaning technique could then be used to remove the dust cake. However, due to the proximity of the neighboring tiers, the large-volume flow of the back-pulse mixing with a huge quantity of dislodged dust cake could potentially perturb the local flow distribution from its initially well-mixed uniform flow and dust concentration. As soon as one spot or patch of dust cake forms on the neighboring candle surface due to this redistributed nonuniform flow and dust concentration, patching dust redeposition will occur on the neighboring tiers, leading eventually to ash bridging. This is because the rigid ceramic candle, unlike the fabric filter, does not flex during back-pulse cleaning; therefore, it cannot tolerate the uneven flow distribution. The back-pulse flow universally seeks the least resistance path, resulting in an uneven or patchy cleaning. Ash bridging is known to cause ceramic candle breakage due to the pulse ratchet problem. To understand the back-pulse cleaning problem caused by the use of high S/V rigid filter elements or the implementation of a multi-tier design, a bench-scale, two-dimensional (2-D) cold flow filter test facility is being constructed, and is scheduled for shakedown and testing in July 1993.

669 (NEDO-P–9210) **Survey on systems to recover CO2 from thermal power plants. 2.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 198p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714898. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A survey was carried out on recovery of CO2 from thermal power plants, and the state of developing technologies to treat recovered CO2 and feasibilities of different technologies were evaluated. CO2 recovering technologies include methods for chemical absorption, physical adsorption, and membrane separation. The submarine treatment process among other recovered CO2 treatments requires elucidation and evaluation on CO2 behavior in ocean and environmental influences. For the underground treatment process, use of rock salt beds, depleted gas fields, and aquifers are discussed. The EOR to force CO2 into oil fields to raise crude oil yield has been implemented in the U.S.A. and other countries. The amount of CO2 that can be utilized in the future is estimated at 63 billion tons worldwide. This process has little environmental effects, but has a problem in capacity increase and energy conservation. To avoid efficiency drop and cost rise in power plants as a result of recovering and treating CO2, LNG/methanol thermal power generation is preferable because of its less CO2 load. In CO2 treatment with the absolute quantity being constant, coal burning power generation with higher CO2 concentration is more advantageous. Recovering CO2 from thermal power plants has no immediate practicability, but has higher future possibility than other fixing technologies. 64 refs., 63 figs., 60 tabs.

670 (NEI-SE–127) **Simultaneous SO_2/NO_x removal in spray-dry scrubbing. Development of process chemistry by application of $Ca(OH)_2$, ZnO, MgO and $NaAlO_2$.** Mroz, T.; Karlsson, H.T. Lund Univ. (Sweden). Dept. of Chemical Engineering II, Chemical Center. Sep 1992. 76p. Order Number DE94709803. Source: OSTI; NTIS.

This report describes the results of laboratory investigations on the possibility of using typical spray-dry scrubbing flue gas desulfurization systems for simultaneous removal of SO_2 and NO_x by changing the process chemistry. The experimental work was focused on the performance of four sorbents: $Ca(OH)_2$, ZnO, MgO and $NaAlO_2$ at the spray-dry scrubbing conditions. The reaction temperature, relative humidity and the composition of the flue gas were taken into consideration as the main process variables. The study has been carried out in the sand bed reactor simulating the fabric filter conditions and in the laboratory spray-dry scrubber focusing on the performance of the two stage system. The preliminary FT-IR analysis of the samples of $Ca(OH)_2$ and $NaAlO_2$ taken from the sand bed rector tests were made in order to uncover the composition of the end product of the SO_2/NO_x removal reactions. Overall NO_x removal was not satisfactory reaching maximum values of 35 and 42 % and simultaneous SO_2 removal 80 and 88 % for $Ca(OH)_2$ and $NaAlO_2$, respectively. Besides lower SO_2NO_x removal ZnO and MgO were causing scaling and plugging problems in the spray-dry scrubber operation. The formation of filter cake for both compounds was rather slow. Additional experiments performed using FT-IR spectroscopy showed possibility of using this method for discovering the composition of the end product of the reaction between sorbents and SO_2/NO_x. However, difficulties in distinguishing the sulfur-nitrogen compounds regarded as the most important products of the SO_2/NO_x removal reaction have been found. The difficulties were caused probably by the unstable character of those compounds and could be overcome by special preparation of the samples and leading in situ FT-IR experiments. 20 refs, 53 figs, 5 tabs.

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Refer also to citation(s) 654, 1954

671 (DOE/EIS–0194) **Draft Environmental Impact Statement: Proposed Tenaska, Washington II Generation Project.** USDOE Bonneville Power Administration, Portland, OR (United States). Aug 1993. 313p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2161). Order Number DE94001267. Source: OSTI; NTIS; GPO Dep.

BPA is considering whether to purchase electrical power from a proposed privately-owned combustion-turbine electrical generation plant in Washington. The plant would be fired by natural gas and would use combined-cycle technology to generate 240 average megawatts (aMW) of energy. The plant would be developed, owned, and operated by Tenaska Power Partners, Inc. The project would be located about 19 kilometers (12 miles) southeast of downtown Tacoma in the Frederickson Industrial Area, Pierce County. The proposed plant would occupy about half of a 6.4-hectare (16-acre) parcel and would be consistent with the industrial character of its surroundings. The proposed site is currently undeveloped and zoned for industrial use by the county. Main environmental concerns identified in the scoping process and evaluated in the Environmental Impact Statement (EIS) include: potential air quality impacts such as emissions and their contribution to the "greenhouse" effect; potential health and safety impacts, such as nuisance odors, plant safety, visibility and heat-emission systems which may affect low-flying planes and potential health effects of electric and magnetic fields, and potential water quality impacts such as the amount of wastewater to be discharged, the source and amount of water required for plant operation. These and other issues are discussed in detail in the EIS. The proposed project already includes many features designed to reduce environmental impacts. Based on investigations performed for the EIS, no significant unavoidable adverse environmental impacts associated with the proposed project were identified, and no evidence emerged to suggest that the proposed action is particularly controversial. The EIS is being mailed to numerous agencies, groups, and individuals. There will be a 45-day comment period, during which a Public Hearing will be held.

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Refer also to citation(s) 654, 656, 657

672 (ANL/EAIS/PP–74946) **Noxious facility impact projection: Incorporating the effects of risk aversion.** Nieves, L.A. Argonne National Lab., IL (United States). [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040884. Source: OSTI; NTIS; INIS; GPO Dep.

Developing new sites for noxious facilities has become a complex process with many potential pitfalls. In addition to the need to negotiate conditions acceptable to the host community, siting success may depend on the facility proposer's ability to identify a candidate site that not only meets technical requirements, but that is located in a community or region whose population is not highly averse to the risks associated with the type of facility being proposed. Success may also depend on the proposer accurately assessing potential impacts of the facility and offering an equitable compensation package to the people affected by it. Facility impact assessments, as typically performed, include only the effects of changes in population, employment and economic activity associated with facility construction and operation. Because of their scope, such assessments usually show a short-run, net economic benefit for the host region, making the intensely negative public reaction to some types and locations of facilities seem unreasonable. The impact component excluded from these assessments is the long-run economic effect of public perceptions of facility risk and nuisance characteristics. Recent developments in psychological and economic measurement techniques have opened the possibility of correcting this flaw by incorporating public perceptions in projections of economic impacts from noxious facilities.

673 (ETDE-GB–507) **Directors' report and accounts for the year ended 31 March 1993.** Scottish Power plc, Glasgow (United Kingdom). 1993. 28p. Order Number DE94706281. Source: OSTI; NTIS (US Sales Only); INIS.

The report of the Directors of Scottish Power for 1992/1993 is presented, and accounting policies, group profit and loss account, balance sheets and group cash flow statement are given. Notes concerning the accounts are included. The report of the Auditors is also presented, and the names of the directors, secretaries and advisors, and shareholder information is listed. (UK)

674 (ETDE-GB–508) **Annual review and summary financial statement 1992/93.** Scottish Power plc, Glasgow (United Kingdom). 1993. 36p. Order Number DE94706282. Source: OSTI; NTIS (US Sales Only); INIS.

The report of the Board of Directors of Scottish Power for 1992/1993 is presented along with the Chairman's statement, the Chief Executive's Review, and the Environmental Statement. A financial review with group profit and loss account, balance sheets and auditors statement is given. Scottish Power welcomes the findings of the Cadbury Committee report on the Financial Aspects of Corporate Governance which recommends that listed companies should include in their report details of their compliance with a Code of Best Practice Highlights such as the 1,486 million pounds turnover, the 220 million pounds profit and the 11.15p dividend per share are quoted. (UK)

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

675 (IAEA-TECDOC–716) **Decontamination and decommissioning of nuclear facilities: Results of a co-ordinated research programme, phase 2: 1989-1993.** International Atomic Energy Agency, Vienna (Austria). Aug 1993. 205p. Order Number DE94603246. Source: OSTI; NTIS (US Sales Only); INIS.

The objectives of this coordinated research programme (CRP) were to promote the exchange of information on the practical experience by Member States in decontamination and decommissioning. The scope of the programme included several areas of decontamination and decommissioning rather than focusing on a single aspect of it, in line with recommendation of the experts who participated in Phase 1 of the CRP. Experts felt that this format would generate better awareness of decontamination and decommissioning and would be more effective vehicle for the exchange of information by stimulating broader discussion on all aspects of decontamination and decommissioning. Special emphasis was given to the development of principles and methodologies to facilitate decommissioning and to the new methods and techniques for optimization of decontamination and disassembly of equipment. Refs, figs, tabs.

676 (INIS-mf–13713) **INSAG-5. A report by the International Nuclear Safety Advisory Group.** Bezpecnost Jadernych Zarizeni. Statni Urad pro Jadernou Bezpecnost, Prague (Czech Republic). 1993. 52p. Translation of IAEA publication (Safety Series. No. 75-INSAG-5) International Atomic Energy Agency, Vienna, 1992. (In Czech). Order Number DE94604584. Source: OSTI; NTIS (US Sales Only); INIS.

The members of INSAG are experts on nuclear safety and radioactive waste disposal, and their views on these topics are presented in the body of the report. At different stages of the historical development on nuclear energy, the focus of attention fell on different safety concerns that had arisen, leading to solution of a succession of safety questions. The design features of nuclear power plants (NPP) and practices developed to ensure safety have been consolidated in a logical structure in IAEA Safety Series No. 75-INSAG-3 (INSAG-3), which contains fifty specific principles. This publication considers safety of NPP with light of heavy water coolants and moderators. The safety of such plants can be estimated from the safety records and the probabilistic safety assessments. Though, as the report says, both methods face some difficulties, yet useful estimates can be made. INSAG recognizes that the safety of the nuclear option must be evaluated in terms of its complete fuel cycle. INSAG lists in this report directions that it believes should be followed in the design of future NPP. The report

also outlines the designs of advanced NPP now being built or available to be built soon. INSAG concludes that there is no technically valid reason to reject a role for nuclear power in meeting society's needs for an expanding source of electricity. 6 tabs., 1 fig., 19 refs.

677 (VTT-TIED–1396) **Numerical simulation methods of fires in nuclear power plants.** Keski-Rahkonen, O. (Technical Research Centre of Finland, Espoo (Finland). Fire Technology Lab.); Bjoerkman, J.; Heikkilae, L. Technical Research Centre of Finland, Espoo (Finland). 1992. 79p. (In Finnish). Order Number DE94605905. Source: OSTI; NTIS; INIS.

Fire is a significant hazard to the safety of nuclear power plants (NPP). Fire may be serious accident as such, but even small fire at a critical point in a NPP may cause an accident much more serious than fire itself. According to risk assessments a fire may be an initial cause or a contributing factor in a large part of reactor accidents. At the Fire Technology and the the Nuclear Engineering Laboratory of the Technical Research Centre of Finland (VTT) fire safety research for NPPs has been carried out in a large extent since 1985. During years 1988-92 a project Advanced Numerical Modelling in Nuclear Power Plants (PALOME) was carried out. In the project the level of numerical modelling for fire research in Finland was improved by acquiring, preparing for use and developing numerical fire simulation programs. Large scale test data of the German experimental program (PHDR Sicherheitsprogramm in Kernforschungscentral Karlsruhe) has been as reference. The large scale tests were simulated by numerical codes and results were compared to calculations carried out by others. Scientific interaction with outstanding foreign laboratories and scientists has been an important part of the project. This report describes the work of PALOME-project carried out at the Fire Technology Laboratory only. A report on the work at the Nuclear Engineering Laboratory will be published separatively. (au).

678 (VTT-TIED–1446) **Standards and guidelines applicable for the validation of programmable automation systems.** Haapanen, P. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering); Maskuniitty, M. Technical Research Centre of Finland, Espoo (Finland). Feb 1993. 75p. (In Finnish). Order Number DE94605906. Source: OSTI; NTIS; INIS.

The validation of programmable automation system for an application important to safety in a nuclear power plant requires a comprehensive view about the system quality and reliability. One central point is to get assured that proper international guidelines and standards have been followed in the design, construction and maintenance of the system. The study was directed to locate international standards and guidelines which can support the validation of programmable systems and to evaluate their applicability for the validation of systems on different levels of requirement during their life cycle. The publication reviews the most important international standards (IAEA, ISO, IEC, IEEE) and their basic principles both for system and application program. Several nuclear standards, which have drawn the main attention, and some general programmable automation standards have been examined. In addition one practical automation system has been examined in order to find essential questions. Based on these studies a set of important items for the qualification have been identified.

2101 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled

Refer also to citation(s) 758, 777, 781, 791, 793, 795, 796, 989

679 (JAERI-M–93-096) **Evaluation of specific heat and temperature of thermite used in melt coolant interaction test in ALPHA program.** Maruyama, Yu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Yamano, Norihiro; Ito, Hideo; Komori, Keiichi; Sonobe, Hisao; Yagioka, Ryuichi; Sugimoto, Jun. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1993. 21p. (In Japanese). Order Number DE94718756. Source: OSTI; NTIS; INIS.

Objectives of ALPHA (Assessment of Loads and Performance of a Containment in a Hypothetical Accident) program are to investigate loads imposed on a containment vessel, and to quantify leak characteristics through the containment during a severe accident of a light water reactor. High temperature melt generated by the thermite reaction between iron oxides and aluminum has been used in the melt coolant interaction test in ALPHA program. Specific heat and temperature at melt surface were evaluated in order to estimate the conversion ratio from thermal to mechanical energy in the event of a steam explosion occurred in the melt coolant interaction test. The evaluated specific heat was about 1000 J/(kg · K), which was close to a calculated value of 960 J/(kg · K) based on the melt composition and material properties at high temperature obtained through the manufacture of thermite. It was found that the surface temperature was about 2700 K immediately after completion of the thermite reaction and is was about 2500 K at 30 seconds after initiation of the thermite reaction. (author).

680 (JAERI-M–93-106) **Conceptual study of test reactor for fuel irradiation/reactor performance research.** Inabe, Teruo (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nakata, Hirokatsu; Akie, Hiroshi. Japan Atomic Energy Research Inst., Tokyo (Japan). May 1993. 112p. (In Japanese). Order Number DE94718750. Source: OSTI; NTIS; INIS.

This report describes the results of conceptual design study of a test reactor for fuel irradiation research and/or reactor performance research as a central facility of the 'Integrated Test Facilities for the Future LWR Technology' which have been developed by JAERI's Advanced LWR Technology Development Program Team. The conceptual design study included the activities concerning reactor system and structural design, and nuclear and thermal performance analyses. Four different types of test reactors were examined. They were a 'PWR/BWR dual type test reactor' to conduct fuel irradiation tests and reactor performance tests under either PWR conditions or BWR conditions, a 'PWR type test reactor' to conduct those tests under PWR conditions, a 'BWR type test reactor' to conduct those tests under BWR conditions, and a 'fuel irradiation test reactor' to conduct fuel irradiation tests only. For the former three test reactors, a central loop in the core and multiple core fuel assemblies in the outer region of the core were intended as fuel irradiation regions. The analyses indicate that these test reactors have a good capability of subjecting a test fuel rod to transient irradiation in the central loop and subjecting test fuel rod bundles to long-term steady irradiation in the core outer regions. As for reactor performance tests, a passive safety reactor was postulated as a test object, and necessary test reactor systems were considered. The fuel irradiation test reactor was designed to be operated under a low pressure and a low temperature and to have four irradiation loops in the core region and 18 vertical holes in the reflector region for irradiation loops and capsules. The analyses indicate that the test reactor has a good capability of subjecting test fuel rod bundles to long-term steady irradiation in the core region and subjecting test fuel rods to transient irradiation in the reflector region. (author).

681 (NUREG/CP–0126-Vol.2, pp. 265-274) **COPO: Experiments for heat flux distribution from a volumetrically heated corium pool.** Kymaelaeinen, O. (Imatran Voima Oy (IVO), Vantaa (Finland)); Hongisto, O.; Antman, J.; Tuomisto, H.; Theofanous, T.G. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23 Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

An experimental facility, COPO, for studying the heat transfer from a molten corium pool has been constructed with emphasis on obtaining a detailed heat flux profile on the side and bottom boundaries. The facility is a Joule-heated, two-dimensional slice of the lower head of a VVER-440 reactor in a linear scale 1:2. In the first results the heat transfer coefficient on the upper boundary was slightly higher than that predicted from existing empirical correlations for cavities of rectangular cross section. No significant local peaking on the side boundary was observed.

682 (NUREG/CP–0126-Vol.2, pp. 343-361) **SCDAP/RELAP5/MOD3 code development.** Allison, C.M. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Siefken, L.J.;

Coryell, E.W. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23 Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

The SCDAP/RELAP5/MOD3 computer code is designed to describe the overall reactor coolant system (RCS) thermal-hydraulic response, core damage progression, and fission product release and transport during severe accidents. The code is being developed at the Idaho National Engineering Laboratory (INEL) under the primary sponsorship of the Office of Nuclear Regulatory Research of the US Nuclear Regulatory Commission (NRC). Code development activities are currently focused on three main areas - (a) code usability, (b) early phase melt progression model improvements, and (c) advanced reactor thermal-hydraulic model extensions. This paper describes the first two activities. A companion paper describes the advanced reactor model improvements being performed under RELAP5/MOD3 funding.

683 (NUREG/CR–4667-Vol.16) **Environmentally assisted cracking in Light Water Reactors: Volume 16: Semiannual report, October 1992–March 1993.** Chung, H.M.; Chopra, O.K.; Ruther, W.E.; Kassner, T.F.; Michaud, W.F.; Park, J.Y.; Sanecki, J.E.; Shack, W.J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Argonne National Lab., IL (United States). Sep 1993. 56p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (ANL–93/27-Vol.16). Source: OSTI; NTIS; INIS; GPO.

This report summarizes work performed by Argonne National Laboratory on fatigue and environmentally assisted cracking (EAC) in light water reactors (LWRs) during the six months from October 1992 to March 1993 Fatigue and EAC of piping, pressure vessels, and core components in LWRs are important concerns as extended reactor lifetimes are envisaged. Topics that have been investigated include (1) fatigue of low-alloy steel used in piping, steam generators, and reactor pressure vessels. (2) EAC of cast stainless steels (SSs), (3) radiation-induced segregation and irradiation-assisted stress corrosion cracking of Type 304 SS after accumulation of relatively high fluence, and (4) EAC of low-alloy steels. Fatigue tests were conducted on medium-sulfur-content A106-Gr B piping and A533-Gr B pressure vessel steels in simulated PWR water and in air. Additional crack growth data were obtained on fracture-mechanics specimens of cast austenitic SSs in the as-received and thermally aged conditions and chromium-nickel-plated A533-Gr B steel in simulated boiling-water reactor (BWR) water at 289°C. The data were compared with predictions based on crack growth correlations for ferritic steels in oxygenated water and correlations for wrought austenitic SS in oxygenated water developed at ANL and rates in air from Section XI of the ASME Code. Microchemical and microstructural changes in high- and commercial-purity Type 304 SS specimens from control-blade absorber tubes and a control-blade sheath from operating BWRs were studied by Auger electron spectroscopy and scanning electron microscopy.

684 (NUREG/GR–0009) **Stepwise integral scaling method and its application to severe accident phenomena.** Ishii, M. (Purdue Univ., West Lafayette, IN (United States). School of Nuclear Engineering); Zhang, G.; No, H.C. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Purdue Univ., Lafayette, IN (United States). School of Nuclear Engineering. Oct 1993. 104p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Grant NRC-04-89-361. Source: OSTI; NTIS; INIS.

Severe accidents in light water reactors are characterized by an occurrence of multiphase flow with complicated phase changes, chemical reaction and various bifurcation phenomena. Because of the inherent difficulties associated with full-scale testing, scaled down and simulation experiments are essential part of the severe accident analyses. However, one of the most significant shortcomings in the area is the lack of well-established and reliable scaling method and scaling criteria. In view of this, the stepwise integral scaling method is developed for severe accident analyses. This new scaling method is quite different from the conventional approach. However, its focus on dominant transport mechanisms and use of the integral response of the system make this method relatively simple to apply to very complicated multi-phase flow problems. In order to demonstrate its applicability and usefulness, three case studies have been made. The phenomena considered are (1) corium dispersion in DCH, (2) corium spreading in BWR MARK-I containment, and (3) incore boil-off and heating process. The results of these studies clearly indicate the effectiveness of their stepwise integral scaling method. Such a simple and systematic scaling method has not been previously available to severe accident analyses.

685 (SKI-TR–91-6/A) **CCF analysis of high redundancy systems safety/relief valve data analysis and reference BWR application: Main report.** Mankamo, T. (Avaplan Oy (Finland)); Bjoere, S.; Olsson, Lena. Swedish Nuclear Power Inspectorate, Stockholm (Sweden). Dec 1992. 83p. Order Number DE94605915. Source: OSTI; NTIS; INIS.

Dependent failure analysis and modeling were developed for high redundancy systems. The study included a comprehensive data analysis of safety and relief valves at the Finnish and Swedish BWR plants, resulting in improved understanding of Common Cause Failure mechanisms in these components. The reference application on the Forsmark 1/2 reactor relief system, constituting of twelve safety/relief lines and two regulating relief lines, covered different safety criteria cases of reactor depressurization and overpressure protection function, and failure to re close sequences. For the quantification of dependencies, the Alpha Factor Model, the Binomial Probability Model and the Common Load Model were compared for applicability in high redundancy systems.

686 (SKI-TR–91-6/B) **CCF analysis of high redundancy systems safety/relief valve data analysis and reference BWR application: Work reports.** Mankamo, T. (Avaplan Oy (Finland)); Bjoere, S.; Olsson, Lena. Swedish Nuclear Power Inspectorate, Stockholm (Sweden). Dec 1992. 204p. Order Number DE94605916. Source: OSTI; NTIS; INIS.

Work reports concerning Common Cause Failures (CCF) analysis of high redundancy systems. Seven work reports are presented.

687 (SKI-TR–93-22) **BWR Generation 3. Forsmark 1, Forsmark 2 and BWR in general.** Nyman, R. (Swedish Nuclear Power Inspectorate, Stockholm (Sweden)); Angner, A. Swedish Nuclear Power Inspectorate, Stockholm (Sweden). 1993. 80p. (In Swedish). Order Number DE94605917. Source: OSTI; NTIS; INIS.

Presents a list of incidents and failures occurred at the Forsmark nuclear power reactors and reported to the Swedish Nuclear Power Inspectorate (SKI) 1983-1991.

688 (STUK-B-YTO–103) **Operation of Finnish nuclear power plants: Quarterly report 3rd quarter, 1992.** Tossavainen, K. (ed.). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Mar 1993. 29p. Order Number DE94605918. Source: OSTI; NTIS; INIS.

Published also in Finnish as report number STUK-B-YTO–102.

Quarterly reports on the operation of Finnish nuclear power plants describe events and observations, relating to nuclear and radiation safety, which the Finnish Centre for Radiation and Nuclear Safety considers safety significant. Also other events of general interest are reported. The reports also include a summary of the radiation safety of plant personnel and the environment, as well as tabulated data on the plants' production and load factors.

689 (STUK-B-YTO–109) **Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1992 and annual summary.** Tossavainen, K. (ed.). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jun 1993. 28p. Order Number DE94605919. Source: OSTI; NTIS; INIS.

Published also in Finnish as report number STUK-B-YTO–108.

Quarterly reports on the operation of Finnish nuclear power plants describe events and observations, relating to nuclear and radiation safety, which the Finnish Centre for Radiation and Nuclear Safety considers significant. Also other events of general interest are reported. The reports also include a summary of the

radiation safety of plant personnel and the environment, as well as tabulated data on the plants' production and load factors.

2102 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

Refer also to citation(s) 679, 680, 681, 682, 683, 684, 688, 689, 758, 774, 775, 780, 782, 786, 791, 793, 794, 801, 802, 803

690 (ANL/ET/CP–79638) **Mechanical properties and examination of cracking in TMI-2 pressure vessel lower head material.** Diercks, D.R.; Neimark, L.A. Argonne National Lab., IL (United States). Sep 1993. 12p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310111–1: Conference and open forum for the presentation of significant results: achievements of the OECD Three Mile Island vessel investigation project, Boston, MA (United States), 20-22 Oct 1993). Order Number DE94001352. Source: OSTI; NTIS; INIS; GPO Dep.

Mechanical tests have been conducted on material from 15 samples removed from the lower head of the Three Mile Island unit 2 nuclear reactor pressure vessel. Measured properties include tensile properties and hardness profiles at room temperature, tensile and creep properties at temperatures of 600 to 1200°C, and Charpy V-notch impact properties at −20 to +300°C. These data, which were used in the subsequent analyses of the margin-to-failure of the lower head during the accident, are presented here. In addition, the results of metallographic and scanning electron microscope examinations of cladding cracking in three of the lower head samples are discussed.

691 (ANL/MCT/CP–78784) **Development of liquid-film tracking models for analysis of AP-600 passive containment cooling system.** Sun, J.G. (Argonne National Lab., IL (United States)); Sha, W.T.; Chen, Y.S. Argonne National Lab., IL (United States). 1993. 30p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001339. Source: OSTI; NTIS; INIS; GPO Dep.

The AP-600, an advanced pressurized water reactor, utilizes a passive containment cooling system (PCCS) to remove heat released inside the containment vessel following postulated design-base accidents (DBAS) such as a main-steam-line break or loss-of-coolant accident. The containment vessel consists of a vertical cylindrical shell and is capped at both top and bottom by a dome that is also a body of revolution with a meridian cross section in the shape of a semiellipse with a horizontal major axis. During a DBA, heat released to the interior of the steel containment vessel is removed by evaporation of a continuously flowing thin liquid film on the outside surface of the vessel, thus lowering the temperature of the steel vessel wall so that steam condenses on its inside surface. The external liquid film is formed by flooding water at top of the ellipsoidal dome. Evaporation of the falling liquid film is enhanced by buoyancy-driven flows of moist air in an annular space outside the steel containment vessel. To ensure PCCS performance, it is necessary to predict both the evaporating film on the outside surface of the vessel and the condensate film on its inside. To this end, two liquid-film tracking models for time-dependent flows (a simplified model and a comprehensive model) have been developed and implemented in the COMMIX code. COMMIX is a general-purpose, time-dependent, multidimensional computer code for thermal hydraulic analysis of single- or multicomponent engineering systems. It solves a system of conservation equations of continuities for up to six species, mixture momentum, and mixture energy, and a k-ε two-equation turbulent model. A unique feature of the COMMIX code is its porous-media formulation, which represents the first unified approach to thermal-hydraulic analysis. The tracking models discussed in this report compute the liquid-film thickness, its mean velocity, and its temperature on both sides of the steel containment vessel.

692 (CEA-CONF–11464) **Modelling of cladding creep collapse.** Koundy, V. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie des Materiaux); Forgeron, T.; Hivroz, J.; Julien, B. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie des Materiaux. 1993. 7p. (CONF-930803–: 12. biennial conference for the International Association for Structural Mechanics in Reactor Technology (SMIRT 12), Stuttgart (Germany), 16-26 Aug 1993). Order Number DE94604586. Source: OSTI; NTIS (US Sales Only); INIS.

The effects of the initial ovality and pressure level on the collapse time of Zircaloy-4 tubing subjected to uniform external pressure were examined experimentally and analytically. Experiments were performed on end closed tubes with two metallurgical states: stress relieved and recrystallized. Numerical simulations were accomplished with a specific computer program based on an analytical approach and the calculated results were compared with the experimental ones. As a comparison, the finite element method is also partially examined in this analysis. Numerical collapse times are in good agreement with regard to experimental results in the case of stress relieved structure. They seem to be too conservative in the case of a recrystallized metallurgical state and the use of the anisotropic option ameliorates numerical results. Sensibility of numerical solutions to the formulation of primary creep laws are presented.

693 (CEA-CONF–11504) **Methods employed to speed up Cathare for simulation uses.** Agator, J.M. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 11p. (CONF-9206411–: Specialist Meeting on simulators and plant analyzers, Lappeenranta (Finland), 9 Jun 1992). Order Number DE94604587. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes the main methods used to speed up the french advanced thermal-hydraulic computer code CATHARE and build a speedy version, called CATHARE-SIMU, adapted to real time calculations and simulation environment. Since CATHARE-SIMU, like CATHARE, uses a numerical scheme based on a fully implicit Newton's iterative method, and therefore with a variable time step, two ways have been explored to reduce the computing time: avoidance of short time steps, and so minimization of the number of iterations per time step, reduction of the computing time needed for an iteration. CATHARE-SIMU uses the same physical laws and correlations as in CATHARE with only some minor simplifications. This was considered the only way to be sure to maintain the level of physical relevance of CATHARE. Finally it is indicated that the validation programme of CATHARE-SIMU includes a set of 33 transient calculations, referring either to CATHARE for two-phase transients, or to measurements on real plants for operational transients.

694 (CNIC–00680) **The startup physics tests of Qinshan nuclear power plant.** Wang Ronger (Qinshan Nuclear Power Company, Zhejiang (China)). China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 10p. (In Chinese). (QNPC–0001.). Order Number DE94604588. Source: OSTI; NTIS (US Sales Only); INIS.

Mr. Wang Ronger is the drafter of this article.

The first startup physics tests of Qinshan Nuclear Power Company's 300 MW PWR are presented. These include the first initial criticality and low power physics tests. Testing items include critical boron concentration, control rod worth, boron worth, power distribution, temperature coefficient of moderator, minimum shutdown boron concentration, rod cluster shoot-out worth, etc. The results of tests verified that the basic requirements for the design and safety of the core have been satisfied.

695 (EDF–93-NB-00022) **Influence of the surface conditions on the sensitivity of alloy 600 tubes to stress corrosion cracking in water.** Garriga-Majo, D.; Todeschini, P.; Vaillant, F.; Van Duysen, J.C. Electricite de France (EDF), 92 - Clamart (France). Dec 1992. 23p. Order Number DE94605939. Source: OSTI; NTIS (US Sales Only); INIS.

Alloy 600 has been used for the fabrication of steam generator tubes of many pressurized water nuclear reactors. In primary water, this alloy is sensitive to a stress corrosion cracking phenomenon (PWSCC). We have characterized by X-ray diffraction cold work near the surface of tubes from various manufacturers. In particular, the effects of sandblasting, abrasive band polishing and heat treatment at 700 deg C have been examined. The results of three types of accelerated corrosion tests (tests on reverse U-bends, constant extension rate tests and constant load tests) have been analyzed using this characterization of superficial cold work.

For reverse U-bend specimens, superficial cold work facilitates the initiation of corrosion cracks. However, the time to failure of the specimens does not seem to depend greatly on the presence of a cold worked layer. For constant extension rate tests and constant load tests, the presence of a superficial cold worked layer considerably reduces the time to failure of the specimens. In this layer, the initiation and/or the propagation of corrosion cracks are facilitated.

696 (EDF–93-NB-00023) **PWR operation and reloading: EDF experience and developments.** Barral, J.C. (Electricite de France (EDF), 75 - Paris (France)); Rosset, F.D. Electricite de France (EDF), 92 - Clamart (France). Jan 1993. 15p. Order Number DE94605940. Source: OSTI; NTIS (US Sales Only); INIS.

The large experience accumulated by EDF in PWR operation and reloading for about fifteen years required reliable and industrial techniques. Presently, about 54 units of 900 MWe and 1300 MWe PWR's are being operated through various fuel managements (three-batch cycle, four-batch cycle, plutonium recycling). EDF has developed two sets of automatized computational sequences with automatic generation of input data and core calculations for both, the Loading Pattern (LP) optimization and initialization of input data (fuel reshuffling), and for reload related calculations (safety evaluation, start-up physics tests prediction, operating data). As far as the LP search is concerned, it consists in a technique of 'trial and error' based upon knowledge and which is under very severe constraints. Then, reload values prediction and core following are performed with codes and calculational methods which have a high level of qualification and calibration over the large experience of in-core measurements. With respect to these different points, continuous efforts are done aimed at improving the overall reloading methods. Developments are being achieved at different levels. Because of load following perturbations, on-line and off-line core power distribution followings are evaluated with fast nodal CAROLINE code. This one is derived from the 3D design COCCINELLE code developed by EDF, and whose main features are 3D core calculations with optimized numerical schemes and fast resolution techniques, fuel thermal and neutronic feed-back effects modelling (pin by pin). As an alternative to LP manual design used currently, EDF has examined two possible approaches: expert system and optimization package. As far as automatic sequences are concerned, a new technique of automatic generation of input files was evaluated but priority has been given to improvements in physics by more 3D extensive calculations with the new COCCINELLE code.

697 (EDF–93-NB-00024) **Thermal ageing of duplex stainless steels.** Massoud, J.P. (Electricite de France (EDF), 77 - Ecuelles (France)); Van Duysen, J.C.; Zacharie, G.; Auger, P.; Danoix, F. Electricite de France (EDF), 92 - Clamart (France). Mar 1992. 27p. Order Number DE94605941. Source: OSTI; NTIS (US Sales Only); INIS.

The evolution of the mechanical properties of Mobearing anf Mo-free cast duplex stainless steels, induced by long term ageing in the range 300-400 deg C, has been studied in relation with the evolution of their microstructure. The unmixing of the ferritic Fe-Cr-Ni, solid solution by three-dimensional (sponge-like) spinodal decomposition and the precipitation of intermetallic G-phase particles are the main characteristics of this microstructural evolution.

698 (EDF–93-NJ-00006) **A discrete optimization method for nuclear fuel management.** Argaud, J.P. Electricite de France (EDF), 92 - Clamart (France). Apr 1993. 18p. Order Number DE94605942. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear loading pattern elaboration can be seen as a combinational optimization problem of tremendous size and with non-linear cost-functions, and search are always numerically expensive. After a brief introduction of the main aspects of nuclear fuel management, this paper presents a new idea to treat the combinational problem by using informations included in the gradient of a cost function. The method is to choose, by direct observation of the gradient, the more interesting changes in fuel loading patterns. An example is then developed to illustrate an operating mode of the method, and finally, connections with simulated annealing and genetic algorithms are described as an attempt to improve search processes.

699 (EDF–93-NJ-00007) **Reflector modelization for neutronic diffusion and parameters identification.** Argaud, J.P. Electricite de France (EDF), 92 - Clamart (France). Apr 1993. 15p. Order Number DE94605943. Source: OSTI; NTIS (US Sales Only); INIS.

Physical parameters of neutronic diffusion equations can be adjusted to decrease calculations-measurements errors. The reflector being always difficult to modelize, we choose to elaborate a new reflector model and to use the parameters of this model as adjustment coefficients in the identification procedure. Using theoretical results, and also the physical behaviour of neutronic flux solutions, the reflector model consists then in its replacement by boundary conditions for the diffusion equations on the core only. This theoretical result of non-local operator relations leads then to some discrete approximations by taking into account the multiscaled behaviour, on the core-reflector interface, of neutronic diffusion solutions. The resulting model of this approach is then compared with previous reflector modelizations, and first results indicate that this new model gives the same representation of reflector for the core than previous.

700 (EDF–93-NJ-00008) **Kinetic methods for the diffusion equations in nuclear PWR.** Warin, X. Electricite de France (EDF), 92 - Clamart (France). Apr 1993. 16p. Order Number DE94605944. Source: OSTI; NTIS (US Sales Only); INIS.

The neutronic diffusion equations are used to calculate the flux in the core of a nuclear reactor. We can solve these equations with direct methods, but these methods are too expensive for slow transient phenomenons. So, according to a method developed by Ott and Meneley, we split the flux into a product of two functions: the first one is only time dependent and is supposed to change rapidly. The second one is time and space dependent but is supposed to vary slowly with time. Numerical results are given and compared to those obtained by a direct resolution of the equations and by experiments.

701 (INIS-mf–13731, pp. 192) **The α-activity and the hot particle sizes in the vicinity of the Chernobyl nuclear power plant.** Akopova, A.B. (Yerevan Phys. Inst., Yerevan (Armenia)); Magradze, N.V.; Moiseenko, A.A.; Ovanian, K.M.; Demchuk, V.V.; Viktorova, N.V.; Ganzha, E.B.; Marenny, A.M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHERNOBYLSK-4 REACTOR/contamination; CONTAMINATION/alpha particles; CONTAMINATION/particle size; ACTIVITY LEVELS; AUTORADIOGRAPHY; CONTAMINATION; DIELECTRIC TRACK DETECTORS; NUCLEAR EMULSIONS; REACTOR ACCIDENTS

702 (INIS-mf–13731, pp. 195) **Application of track detectors for soil, water and objects' surfaces alpha-activity measurement in 30-km zone of the Chernobyl NPP.** Gromov, A.V. (RPA 'V.G. Khlopin Radium Inst.', Saint-Petersburg (Russian Federation)); Kopchenov, V.E.; Krivokhatskiy, A.S.; Nikolaev, V.A.; Stolyarov, S.V.; Tokarevskiy, V.V. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA DETECTION/chernobylsk-4 reactor; DIELECTRIC TRACK DETECTORS/alpha detection; ACTIVITY LEVELS; SOILS; SPARK COUNTERS; SURFACES; WATER

703 (NUREG/CP–0126-Vol.2, pp. 275-300) **Results from in-reactor severe fuel damage tests that used full-length fuel rods and the relevancy to LWR severe accident melt progression safety issues.** Panisko, F.E. (Pacific Northwest Lab., Richland, WA (United States)); Lombardo, N.J. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23

Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

This paper presents results from four tests conducted to assess the behavior of full-length, light-water reactor fuel rods and the resulting damage in the event of a severe accident. The tests, identified as FLHT-1, -2, -4, and -5, were performed by Pacific Northwest Laboratory (PNL) in the National Research Universal reactor at Chalk River, Ontario, Canada, for the US Nuclear Regulatory Commission. The findings revealed that the axial extent of the oxidation-induced damage increased with the length of time testing was conducted at high temperature; the region of rapid Zircaloy oxidation was confined to an axial length of 20 centimeters, which moved rapidly down the length of the bundle; only the Zircaloy below the coolant/steam interface would not be expected to participate in generating hydrogen; the relocation of molten materials was tied to the passage of the oxidation burn front; and cohesive blockages were not formed at the bottom of the fuel bundle as typically found in the short-length severe fuel damage tests.

704 (NUREG/CP–0126-Vol.2, pp. 445-460) **Peak cladding temperature in LOFT large break transients.** Berta, V.T. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Hanson, R.G.; Johnsen, G.W.; Schultz, R.R. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23 Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

The fuel centerline temperature data in LOFT large break experiments LP-02-6 and LP-LB-1 were analyzed to determine the bias at peak cladding temperature (PCT) in the cladding exterior surface-mounted thermocouples and the effect of the thermocouple cable on the thermal behavior of the cladding. A statistically determined bias of 11.4 K +/- 16.2 K was found in the cladding thermocouples (measured less than actual PCT). The fin effect of the thermocouple cable was determined to be small and within the uncertainty of the data in the blowdown phase of the transients in which PCT occurred. The PCT in LOFT experiments LP-02-6 and LP-LB-1 was determined to be 1104.8 K and 1284.0 K respectively.

705 (NUREG/CP–0126-Vol.2, pp. 461-483) **Natural circulation under severe accident conditions.** Pafford, D.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Hanson, D.J.; Tung, V.X.; Chmielewski, S.V. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23 Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

Research is being conducted to better understand natural circulation phenomena in mixtures of steam and noncondensibles and its influence on the temperature of the vessel internals and the hot leg, pressurizer surge line, and steam generator tubes. The temperature of these structures is important because their failure prior to reactor vessel lower head failure could reduce the likelihood of containment failure as a result of direct containment heating. Computer code calculations (MELPROG, SCDAP/RELAP5/MOD3) predict high fluid temperatures in the upper plenum resulting from in-vessel natural circulation. Using a simple model for the guide tube phenomena, high upper plenum temperatures are shown to be consistent with the relatively low temperatures that were deduced metallurgically from leadscrews removed from the TMI-2 upper plenum. Evaluation of the capabilities of the RELAP5/MOD3 computer code to predict natural circulation behavior was also performed. The code was used to model the Westinghouse natural circulation experimental facility. Comparisons between code calculations and results from experiments show good agreement.

706 (NUREG/CP–0126-Vol.2, pp. 485-510) **PWR depressurization analyses.** Brownson, D.A. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Dobbe, C.A.; Knudson, D.L. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Brookhaven National Lab., Upton, NY (United States). Mar 1993. (CONF-921007–Vol.2: 20. water reactor safety information meeting, Bethesda, MD (United States), 21-23 Oct 1992). In *Proceedings of the US Nuclear Regulatory Commission twentieth water reactor safety information meeting: Volume 2, Severe accident research, Thermal hydraulics.* 568p. Source: OSTI; NTIS; INIS; GPO.

Early containment failure resulting from direct containment heating (DCH) has been identified as a potential contributor to the risk of operating a pressurized water reactor (PWR). One important factor needed to evaluate the contribution of DCH to risk is the conditional probability that, given a core melt, the primary system will be at high pressure when the reactor vessel lower head fails. Two mechanisms that could reduce the pressure during a station blackout core melt accident are discussed. First, natural circulation in the reactor coolant system (RCS) could cause a temperature-induced failure of the RCS pressure boundary, which could result in unintentional (without operator action) depressurization. Second, plant operators could open relief valves in an attempt to intentionally depressurize the RCS prior to lower head failure. Results from analytical studies of these two depressurization mechanisms for select PWRs are presented.

707 (NUREG/CR–5968) **Potential change in flaw geometry of an initially shallow finite-length surface flaw during a pressurized-thermal-shock transient.** Shum, D.K. (Oak Ridge National Lab., TN (United States)); Bryson, J.W.; Merkle, J.G. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Sep 1993. 22p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12279). Source: OSTI; NTIS; INIS; GPO.

This study presents preliminary estimates on whether an shallow, axially oriented, inner-surface finite-length flaw in a PWR-RPV would tend to elongate in the axial direction and/or deepen into the wall of the vessel during a postulated PTS transient. Analysis results obtained based on the assumptions of (1) linear-elastic material response, and (2) cladding with same toughness as the base metal, indicate that a nearly semicircular flaw would likely propagate in the axial direction followed by propagation into the wall of the vessel. Note that these results correspond to initiation within the lower-shelf fracture toughness temperature range, and that their general validity within the lower-transition temperature range remains to be determined. The sensitivity of the numerical results aid conclusions to the following analysis assumptions are evaluated: (1) reference flaw geometry along the entire crack front and especially within the cladding region; (2) linear-elastic vs elastic-plastic description of material response; and (3) base-material-only vs bimaterial cladding-base vessel-model assumption. The sensitivity evaluation indicates that the analysis results are very sensitive to the above assumptions.

708 (NUREG/CR–6071) **Impact of ENDF/B-VI cross-section data on H. B. Robinson Cycle 9 dosimetry calculations.** Williams, M.L. (Louisiana State Univ., Baton Rouge, LA (United States). Nuclear Science Center); Asgari, M.; Kam, F.B.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Oct 1993. 21p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12406). Source: OSTI; NTIS; INIS; GPO.

Dosimeters that were removed from the H. B. Robinson reactor following Cycle 9 were analyzed and compared with calculated results in an earlier study. This work updates the calculation using recently available ENDF/B-VI data in order to assess advantages to using the newer cross sections in reactor pressure vessel fluence calculations. A comparison is also made to determine the impact of various cross-section libraries on computed dosimeter activities. Significant improvements are obtained with the ENDF/B-VI cross sections. Other factors, such as differences in group

structures of multigroup libraries, may also affect the calculated dosimeter activities.

709 (NUREG/IA–0113) **Preliminary assessment of PWR Steam Generator modelling in RELAP5/MOD3: International Agreement Report.** Preece, R.J. (National Power, Leatherhead (United Kingdom). Technology and Environment Centre); Putney, J.M. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; National Power, Leatherhead (United Kingdom). Technology and Environment Centre. Jul 1993. 18p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Prepared as part of the Agreement on Research Participation and Technical Exchange under the International Thermal-Hydraulic Code Assessment and Application Program (ICAP).

A preliminary assessment of Steam Generator (SG) modelling in the PWR thermal-hydraulic code RELAP5/MOD3 is presented. The study is based on calculations against a series of steady-state commissioning tests carried out on the Wolf Creek PWR over a range of load conditions. Data from the tests are used to assess the modelling of primary to secondary side heat transfer and, in particular, to examine the effect of reverting to the standard form of the Chen heat transfer correlation in place of the modified form applied in RELAP5/MOD2. Comparisons between the two versions of the code are also used to show how the new interphase drag model in RELAP5/MOD3 affects the calculation of SG liquid inventory and the void fraction profile in the riser.

710 (WAPD-T–2958) **End-of-life irradiation performance of core structural components in the Shippingport Light Water Breeder Reactor.** Clayton, J.C.; Smith, B.C. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1991]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-910808–10: 5. international symposium on environmental degradation of materials in nuclear power systems - water reactors, Monterey, CA (United States), 25-29 Aug 1991). Order Number DE94001902. Source: OSTI; NTIS; INIS; GPO Dep.

Nondestructive and destructive end-of-life examinations of Light Water Breeder Reactor (LWBR) core structural components were performed following operation in the Shippingport Atomic Power Station for 29,047 effective full power hours. The Shippingport LWBR demonstrated that breeding can be achieved in a light water reactor with thorium and uranium-233 oxide fuel pellets contained in Zircaloy-4 tubes. The purpose of this presentation is to report results of LWBR core structural component examinations that were carried out to assess the effects of irradiation on support structure and to provide a data base for the evaluation of design procedures. The postirradiation nondestructive examinations included visual inspection and, in some cases, dye penetrant testing to assess structural integrity and surface conditions of the components. Destructive metallography was performed to assess cracking, corrosion buildup, and microstructural condition.

711 (WAPD-T–2967) **FLASH analysis of the MB-2 steady state, operational transient and stability tests.** Coffield, R.D.; Lincoln, F.W.; Johnson, E.G. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-930830–30: National conference and exposition on heat transfer, Atlanta, GA (United States), 8-11 Aug 1993). Order Number DE94001906. Source: OSTI; NTIS; GPO Dep.

This report describes testing performed in the Model Boiler No. 2 (MB-2) facility located at the Westinghouse Engineering Test Facility in Tampa, Florida which provided valuable data for validating steam generator computer code analytical models. MB-2 is scaled to represent a vertical tube Model F steam generator which is used in many commercial PWR plants. A major consideration in the MB-2 test rig design was to make it as prototypical as possible to the Model F commercial PWR steam generator.

2103 Power Reactors, Nonbreeding, Graphite Moderated

Refer also to citation(s) 754, 772

712 (CNIC–00668) **A simulating test of coolant temperature mixing.** Wang Dazhong (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Yao Meisheng; Jiang Zhiqiang; Gao Zuying; Tong Yunxian. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 10p. (TSHUNE–0049.). Order Number DE94604593. Source: OSTI; NTIS (US Sales Only); INIS.

In order to investigate the performance of gas coolant temperature mixing in the outlet of a 350 MW HTR-Module with annular pebble bed core, a simulating test has been completed in a 1 : 3.7 analytical simulating test model. The test model and main test results are described. The results show that the structure of outlet coolant channel has good function of coolant temperature mixing. It can reduce the temperature deviation of outlet coolant of the annular pebble bed core to the allowance before the coolant enters into steam generator.

713 (CONF-930913–44) **Dismantled weapons fuel burning in molten salt reactors.** Gat, U.; Engel, J.R. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Global '93: future nuclear systems - emerging fuel cycles and waste disposal options; Seattle, WA (United States); 12-17 Sep 1993. Order Number DE94000479. Source: OSTI; NTIS; INIS; GPO Dep.

The advantages of burning fissile material from dismantled weapons in molten salt reactors (MSRs) are described. The fluid fuel MSRs with some, or full, processing are nondedicated reactors that generate energy and completely burn the fissile material on a continuous basis. No fuel fabrication is needed, and the entire dismantling can be done in a secure facility. Shipments are made in small, safe, and secure quantities. Denaturing, spiking, or mixing can be done at the source for added safety. MSRs are very safe reactors that help close the fuel cycle and simplify waste treatment, thereby contributing to acceptability. Additionally, MSRs are expected to be economically competitive as electric power stations. The safety, security, simplicity, economy, and proliferation resistant properties support the deployment in countries that have the need.

714 (JAERI-M–93-097) **Analysis of the plate-out distribution in the VAMPYR-I experiments by PLAIN code.** Sawa, Kazuhiro (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Shiozawa, Shusaku; Baba, Osamu. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1993. 28p. Order Number DE94718752. Source: OSTI; NTIS; INIS.

Fission products plate-out analysis code, PLAIN, was developed to calculate the plate-out distribution in the primary cooling system of High Temperature Gas-cooled Reactor (HTGR). As one of the verification works of the PLAIN code, calculations of the plate-out densities in VAMPYR-I experiments were carried out. The VAMPYR-I was a test equipment installed in the experimental HTGR in Germany, AVR, to investigate fission products plate-out behavior. The calculated plate-out densities were smaller than measured ones in the upper region of the test-tube of VAMPYR-I and it is considered that the difference is caused by the dust effect. (author).

2105 Power Reactors, Breeding

Refer also to citation(s) 178, 234, 235, 281, 751, 980

715 (ANL/FC/CP–80288) **Fuel cycle facility control system for the Integral Fast Reactor Program.** Benedict, R.W.; Tate, D.A. Argonne National Lab., Idaho Falls, ID (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931006–2: Joint power generation conference, Kansas City, MO (United States), 17-21 Oct 1993). Order Number DE93041161. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Integral Fast Reactor (IFR) Fuel Demonstration, a new distributed control system designed, implemented and installed. The Fuel processes are a combination of chemical and machining processes operated remotely. To meet this special requirement, the new control system provides complete sequential logic control motion and positioning control and continuous PID

loop control. Also, a centralized computer system provides near-real time nuclear material tracking, product quality control data archiving and a centralized reporting function. The control system was configured to use programmable logic controllers, small logic controllers, personal computers with touch screens, engineering work stations and interconnecting networks. By following a structured software development method the operator interface was standardized. The system has been installed and is presently being tested for operations.

716 (ANL/FE/CP–78906) **Upgrade of 400,000 gallon water storage tank at Argonne National Laboratory-West to UCRL-15910 high hazard seismic requirements.** Griffin, M.J. (EQE International, Inc., Irvine, CA (United States)); Harris, B.G. Argonne National Lab., Idaho Falls, ID (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310102–23: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94000465. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Integral Fast Reactor (IFR) Project at Argonne National Laboratory West (ANL-W), it was necessary to strengthen an existing 400,000 gallon flat-bottom water storage tank to meet UCRL-15910 (currently formulated as DOE Standard DOE-STD-1020-92, Draft) high hazard natural phenomena requirements. The tank was constructed in 1988 and preliminary calculations indicated that the existing base anchorage was insufficient to prevent buckling and potential failure during a high hazard seismic event. General design criteria, including ground motion input, load combinations, etc., were based upon the requirements of UCRL-15910 for high hazard facilities. The analysis and capacity assessment criteria were based on the Generic Implementation Procedure developed by the Seismic Qualification Utilities Group (SQUG). Upgrade modifications, consisting of increasing the size of the Generic Implementation Procedure developed by the Seismic Qualification Utilities Group (SQUG). Upgrade modifications, consisting of increasing the size of the foundation and installing additional anchor bolts and chairs, were necessary to increase the capacity of the tank anchorage/support system. The construction of the upgrades took place in 1992 while the tank remained in service to allow continued operation of the EBR-II reactor. The major phases of construction included the installation and testing of 144 1/14in. x 15in., and 366 1in. x 16in. epoxied concrete anchors, placement of 220 cubic yards of concrete heavily reinforced, and installation of 24 1-1/2in. x 60in. tank anchor bolts and chairs. A follow-up inspection of the tank interior by a diver was conducted to determine if the interior tank coating had been damaged by the chair welding. The project was completed on schedule and within budget.

2106 Power Reactors, Mobile, Propulsion, Package, and Transportable

Refer also to citation(s) 747, 805, 1094, 1095

717 (BNL–49463) **Temperature and Doppler coefficients of various space nuclear reactors.** Mughabghab, S.F.; Ludewig, H. Schmidt, E. Brookhaven National Lab., Upton, NY (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94001388. Source: OSTI; NTIS; INIS; GPO Dep.

Temperature and Doppler feedback effects for a Particle Bed Reactor (PBR) designed to operate as a propulsion reactor are investigated. Several moderator types and compositions fuel enrichments and reactor sizes are considered in this study. From this study it could be concluded that a PBR can be configured which has a negative prompt feedback, zero coolant worth, and a small positive to zero moderator worth. This reactor would put the lowest demands on the control system.

718 (DOE/SF/19441–T4) **SPACE-R Thermionic Space Nuclear Power System: Design and Technology Demonstration Program: Semiannual technical progress report for period ending March 1993.** Space Power, Inc., San Jose, CA (United States). May 1993. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-92SF19441. Order Number DE93013969. Source: OSTI; NTIS; GPO Dep.

This Semiannual Technical Progress Report summarizes the technical progress and accomplishments for the Thermionic Space Nuclear Power System (TI-SNPS) Design and Technology Demonstration Program of the Prime Contractor, Space Power Incorporated (SPI), its subcontractors and supporting National Laboratories during the first half of the Government Fiscal Year (GFY) 1993. SPI's subcontractors and supporting National Laboratories include: Babcock & Wilcox for the reactor core and externals; Space Systems/Loral for the spacecraft integration; Thermocore for the radiator heat pipes and the heat exchanger; INERTEK of CIS for the TFE, core elements and nuclear tests; Argonne National Laboratories for nuclear safety, physics and control verification; and Oak Ridge National laboratories for materials testing. Parametric trade studies are near completion. However, technical input from INERTEK has yet to be provided to determine some of the baseline design configurations. The INERTEK subcontract is expected to be initiated soon. The Point Design task has been initiated. The thermionic fuel element (TFE) is undergoing several design iterations. The reactor core vessel analysis and design has also been started.

719 (LA-UR–93-3324) **Assessment of an SP-100 Bimodal propulsion and power system.** Buksa, J.J. (Los Alamos National Lab., NM (United States)); DeMuth, S.; Huber, T. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940101–4: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94000889. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The attractiveness of using the SP-100 space nuclear power system for both electric power production and direct thermal propulsion is discussed. A conceptual modification to the SP-100 generic flight system that uses its hot, primary coolant to directly heat hydrogen propellant is presented. An analytical model of the system and its orbital-mechanical behavior is presented and used to assess the benefits of a number of orbital transfer missions. Both a 500 kW and a 2.4 MW system are assessed. Preliminary results indicate that for LEO-to-GEO transfers, the SP-100 bimodal system offers a 100% increase in payload over conventional chemical-only propulsion systems with transfer times on the order of days.

720 (LA-UR–93-3361) **SP-100 heat transport technology development.** Buksa, J.J. Los Alamos National Lab., NM (United States). 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940101–11: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94000769. Source: OSTI; NTIS (US Sales Only); GPO Dep.

SP-100 space nuclear power system heat transport technology is reviewed, and we discuss progress to date in several key areas. Technical challenges, achievements, and the current status of the thermoelectric-electromagnetic pump and gas separator/accumulator components are presented. Validation experiments, analytical models, and manufacturing processes developed for these components are summarized. Remaining components of the heat transport subsystems, including the auxiliary cooling and thaw subsystem are also discussed briefly. A concise bibliography is supplied, where further detailed information on specific technical issues can be found.

721 (SAND–92-7343) **F2D users manual: A two-dimensional compressible gas flow code.** Suo-Anttila, A. (Science Applications International Corp., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States); Science Applications International Corp., Albuquerque, NM (United States). Aug 1993. 69p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000653. Source: OSTI; NTIS; GPO Dep.

The F2D computer code is a general purpose, two-dimensional, fully compressible thermal-fluids code that models most of the phenomena found in situations of coupled fluid flow and heat transfer. The code solves momentum, continuity, gas-energy, and structure-energy equations using a predictor-corrector solution algorithm.

The corrector step includes a Poisson pressure equation. The finite difference form of the equation is presented along with a description of input and output. Several example problems are included that demonstrate the applicability of the code in problems ranging from free fluid flow, shock tubes and flow in heated porous media.

722 (WINCO–11981) **Improved gas core propulsion model.** Tanner, J.E. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-940101–13: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94000929. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A thermodynamic, radiation transport model of a gas core nuclear propulsion reactor has been developed in one-dimensional, spherical geometry, which satisfies local energy balance and allows for arbitrary variation of fuel/propellant ratio and flow rate as functions of radius. Initial cases calculated yield specific impulses of about 1150 sec, but very low thrusts ranging 5–10 kN.

2107 Regulation and Licensing

Refer also to citation(s) 787, 790

723 (NUREG–0540-Vol.15-No.8) **Title list of documents made publicly available, August 1–31, 1993: Volume 15, No. 8.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Oct 1993. 320p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This document is a monthly publication containing descriptions of information received and generated by the US Nuclear Regulatory commission (NRC). This information includes docketed material associated with civilian nuclear power plants and other uses of radioactive materials, and nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. The following indexes are included: Personal Author corporate Source, Report Number, and Cross Reference of Enclosures to Principal Documents.

724 (NUREG–1363-Vol.5) **Atomic Safety and Licensing Board Panel annual report, Fiscal year 1992.** Nuclear Regulatory Commission, Washington, DC (United States). Atomic Safety and Licensing Board Panel. Sep 1993. 34p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

In Fiscal Year 1992, the Atomic Safety and Licensing Board Panel ("the Panel") handled 38 proceedings. The cases addressed issues in the construction, operation, and maintenance of commercial nuclear power reactors and other activities requiring a license from the Nuclear Regulatory Commission. This reports sets out the Panel's caseload during the year and summarizes, highlights, and analyzes how the wide-ranging issues raised in those proceedings were addressed by the Panel's judges and licensing boards.

2108 Economics

Refer also to citation(s) 173, 331, 715

725 (HW–59938) **A closed uranium cycle at HAPO: Phase 1.** Hamilton, W.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 9 Apr 1959. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040786. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This study was undertaken to determine the most feasible and economical process or path for closing the uranium fuel cycle at HAPO, and to establish what benefits, other than improvement in FPD's competitive position, would result from the selected closed fuel cycle. The study was separated into four phases; Phase I includes the selection and organization of plausible processes and the establishment of a realistic and effective evaluation procedure, Phase II will include evaluation and selection of an optimum path based on a medium range and a short range approach (5 to 10 years), Phase III will include evaluation and selection of an optimum path based on a long range approach (> 10 yrs.), and Phase IV will include refinement of previous work and issuance of a final report summarizing the study and the conclusions or recommendations which develop from the study. Phase I of the study has been completed. The purpose of this paper is to document the assembled data and the completed work.

726 (INIS-mf–13516) **Proceedings of the Indo-Japan seminar on thorium utilization (held at Bombay during December 10-13, 1990).** Indian Nuclear Society, Bombay (India); Atomic Energy Society of Japan, Tokyo (Japan). 1991. 300p. (CONF-9012164–: Indo-Japan seminar on thorium utilization, Bombay (India), 10-13 Dec 1990). Order Number DE93623250. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

727 (INIS-mf–13712) **Policy planning for nuclear power: An overview of the main issues and requirements.** International Atomic Energy Agency, Vienna (Austria). Aug 1993. 27p. Order Number DE94604674. Source: OSTI; NTIS (US Sales Only); INIS.

This special report, Policy Planning for Nuclear Power: An Overview of the Main Issues and Requirements, has been prepared in response to the express request of a number of IAEA Member States for a document to assist makers in developing countries on the introduction of nuclear power. The report contains information on the political, governmental, economic, financial and technical issues and requirements associated with planning and implementing a safe, economic and reliable nuclear power programme. It highlights the main areas in which policies must be developed and decisions taken, as well as the role and responsibilities of government, the plant owner and national industry. Also presented are the main criteria to assist policy planners in defining options and strategies which can achieve a balance among such objectives as cost effective and efficient electricity production, realistic and acceptable financing arrangements, national development requirements, safety and environmental protection. Further information and details on the technical and other issues presented in this report are given in the list of related IAEA publications and documents at the end of this report.

728 (SKB-TR–92-44) **Project on Alternative Systems Study - PASS. Cost comparison of repository systems.** Ageskog, L. (VBB Viak AB (Sweden)); Hoegbom, T. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Sep 1992. 65p. Order Number DE94606173. Source: OSTI; NTIS; INIS.

The development of alternative repository systems and different canister alternatives is being studied by SKB within the frame of the 'Project on Alternative Systems Study, PASS', with the objective of presenting a ranking of systems being currently studied. The rankings is primarily made for three different headings: technology, long-term performance and safety, and costs. The ranking for each of these headings are eventually to be merged into one ranking. The present report presents the basis for the ranking regarding costs. The following four systems have been studied and are presented in order of cost (the less expensive first): Medium Long Holes (MLH), KBS-3 (Modified Plan 92 system), Very Long Holes (VLH), and Very Deep Holes (VDH). A significant outcome of the study was the clear difference in cost between the very expensive system VDH and the other three.

2109 Process Heat Reactors

Refer also to citation(s) 733

729 (CNIC–00652) **Spatial filtering of low velocity and thermal unbalanced flow.** Han Bing (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Tong Yunxian; Li Rizhu; Tian Hong; Li Jun. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 10p. (In Chinese). (TSHUNE–0046.). Order Number DE94604602. Source: OSTI; NTIS (US Sales Only); INIS.

A new method has been developed to realize measurements of coolant flow in the core of integrated Low Temperature Heating Reactor. The principle of measurement using spatial filtering to measure flow velocity is described. The space weight function for

the thermocouple space filter is derived and analyzed. Under the assumption of that the temperature fluctuation is white noise, the characteristics of time-frequency-domain of the thermocouple space filter and effects of thermocouple time constant on them are analysed. A simplified theoretical model of measuring flow velocity by using thermocouple spatial filter is developed. The experiments and results on thermocouple space filter are given.

730 (CNIC–00697) **A HR-200 nuclear desalination system.** Wang Dazhon (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Dong Duo; Zhang Dafang. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 12p. (In Chinese). (TSHUNE–0057.). Order Number DE94604603. Source: OSTI; NTIS (US Sales Only); INIS.

A HR-200 nuclear desalination system is proposed which consists of one unit of 200 MW(t) nuclear heating reactor and multi-effect distillation (MED) process plant. The output of processed water of the system is $(12 \approx 15) \times 10^4$ m^3/d. The design characteristics and safety features of 200 MW(t) nuclear heating reactor are introduced. It is indicated that in the view of safety, economy and environment protection, nuclear energy as a substitute energy in the sea water desalination is feasible. The prospect of its application at dry areas in China and world is bright.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory and Calculation

Refer also to citation(s) 722, 760, 1660

731 (JINR-R–13-93-95) **Nonlinearity of power feedback of the IBR-2 reactor.** Kamionskij, V.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 10p. (In Russian). Order Number DE94605883. Source: OSTI; NTIS (US Sales Only); INIS.

The nonlinear behaviour of the pulses power in the experiments on determination of the power feedback parameters of IBR-2 reactor is revealed. Assuming the dependence of the power reactivity coefficient on the fuel temperature the power feedback parameters are determined using the pulse frequency tracsfer function method. Considering this assumption the stability of the parameters, time constants and power coefficients of reactivity are shown. 6 refs.; 3 figs.; 2 tabs.

732 (LA–12659-MS) **Minimum critical mass analytical studies.** Sanchez, R.G. Los Alamos National Lab., NM (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001891. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Analytical studies have confirmed that the minimum critical mass for ^{235}U in a critical reactor assembly moderated with high-density polyethylene and surrounded by a thick-beryllium reflector is on the order of 275 g. Similar studies have also shown that the minimum critical masses for ^{233}U and alpha-phase ^{239}Pu in the same type of critical assembly and surrounded by a thick-beryllium reflector are on the order of 185 g and 190 g, respectively.

2202 Components and Accessories

Refer also to citation(s) 494, 776, 787, 789, 790, 999, 1805

733 (CNIC–00667) **Design and experimental study on a gravitational hydraulic gripper without power driven.** Wang Dazhong (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Zhuang Jin; Ma Changwen; Hu Jiuda. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 7p. (In Chinese). (TSHUNE–0048.). Order Number DE94604568. Source: OSTI; NTIS (US Sales Only); INIS.

A new type gripper with no power supply for loading or unloading a fuel assembly into or from the core of low temperature heating reactor is developed and tested. The operating principle, characteristics of structure, designing parameters and remarkable advantages are introduced, ease in operation and reliable. It can be used in other light water reactors for fuel assembly handling operation.

734 (EGG-MS–10781) **Review of Section XI inservice inspection program effectiveness.** Cook, J.F. Sr. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1993. 360p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002860. Source: OSTI; NTIS; INIS; GPO Dep.

To evaluate the effectiveness of Section XI, Division 1, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, searches were performed of the Licensing Event Report and Nuclear Plant Reliability Data System computerized data bases, and a review was made of inservice inspection summary reports. It was found that the Section XI examinations and tests detect flaws in welds and plant components and result in subsequent corrective action. This study also shows that the format and topics of information provided in Section XI-prescribed inservice inspection summary reports vary widely.

735 (JAERI-M–93-078) **Statistical analyses of variability/reproducibility of environmentally assisted cyclic crack growth rate data utilizing JAERI Material Performance Database (JMPD).** Tsuji, Hirokazu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Yokoyama, Norio; Nakajima, Hajime; Kondo, Tatsuo. Japan Atomic Energy Research Inst., Tokyo (Japan). May 1993. 47p. Order Number DE94718641. Source: OSTI; NTIS; INIS.

Statistical analyses were conducted by using the cyclic crack growth rate data for pressure vessel steels stored in the JAERI Material Performance Database (JMPD), and comparisons were made on variability and/or reproducibility of the data between obtained by ΔK-increasing and by ΔK-constant type tests. Based on the results of the statistical analyses, it was concluded that ΔK-constant type tests are generally superior to the commonly used ΔK-increasing type ones from the viewpoint of variability and/or reproducibility of the data. Such a tendency was more pronounced in the tests conducted in simulated LWR primary coolants than those in air. (author).

736 (NUREG/CP–0131) **Proceedings of the Joint IAEA/CSNI Specialists' Meeting on Fracture Mechanics Verification by Large-Scale Testing held at Pollard Auditorium, Oak Ridge, Tennessee.** Pugh, C.E. (Oak Ridge National Lab., TN (United States)); Bass, B.R.; Keeney, J.A. (comps.). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Oct 1993. 893p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12413;CONF-9210411–: Joint IAEA/CSNI specialists' meeting on fracture mechanics verification by large-scale testing, Oak Ridge, TN (United States), 26-29 Oct 1992). Source: OSTI; NTIS; INIS; GPO.

This report contains 40 papers that were presented at the Joint IAEA/CSNI Specialists' Meeting Fracture Mechanics Verification by Large-Scale Testing held at the Pollard Auditorium, Oak Ridge, Tennessee, during the week of October 26–29, 1992. The papers are printed in the order of their presentation in each session and describe recent large-scale fracture (brittle and/or ductile) experiments, analyses of these experiments, and comparisons between predictions and experimental results. The goal of the meeting was to allow international experts to examine the fracture behavior of various materials and structures under conditions relevant to nuclear reactor components and operating environments. The emphasis was on the ability of various fracture models and analysis methods to predict the wide range of experimental data now available. The individual papers have been cataloged separately.

737 (NUREG/CR–6043-Vol.1) **Aging assessment of essential HVAC chillers used in nuclear power plants: Phase 1, Volume 1.** Blahnik, D.E. (Pacific Northwest Lab., Richland, WA (United States)); Klein, R.F. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 93p. Sponsored by Nuclear Regulatory Commission, Washington, DC

(United States). DOE Contract AC06-76RL01830. (PNL–8614-Vol.1). Source: OSTI; NTIS; INIS; GPO.

The Pacific Northwest Laboratory conducted a Phase I aging assessment of chillers used in the essential safety air-conditioning systems of nuclear power plants. Centrifugal chillers in the 75- to 750-ton refrigeration capacity range are the predominant type used. The chillers used, and air-conditioning systems served, vary in design from plant-to-plant. It is crucial to keep chiller internals very clean and to prevent the leakage of water, air, and other contaminants into the refrigerant containment system. Periodic operation on a weekly or monthly basis is necessary to remove moisture and noncondensable gases that gradually build up inside the chiller. This is especially desirable if a chiller is required to operate only as an emergency standby unit. The primary stressors and aging mechanisms that affect chillers include vibration, excessive temperatures and pressures, thermal cycling, chemical attack, and poor quality cooling water. Aging is acceierated by moisture, non-condensable gases (e.g., air), dirt, and other contamination within the refrigerant containment system, excessive start/stop cycling, and operating below the rated capacity. Aging is also accelerated by corrosion and fouling of the condenser and evaporator tubes. The principal cause of chiller failures is lack of adequate monitoring. Lack of performing scheduled maintenance and human errors also contribute to failures.

738 (NUREG/CR–6098) **Loading rate effects on strength and fracture toughness of pipe steels used in Task 1 of the IPIRG program.** Marschall, C.W. (Battelle, Columbus, OH (United States)); Landow, M.P.; Wilkowski, G.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Battelle, Columbus, OH (United States). Oct 1993. 126p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Grant D2060. (BMI–2175). Source: OSTI; NTIS; INIS; GPO.

Material characterization tests were conducted on laboratory specimens machined from pipes to determine the effect of dynamic loading (i.e., rates comparable to those for high amplitude seismic events) on tensile properties and fracture resistance at 288 C (550 F). Specimens were fabricated from seven different pipes, including carbon steels and stainless steels (both base metal and weld metal), which were to be subjected to full-scale pipe tests in IPIRG Task 1.0. For the stainless steels tested at 288 C (550 F), tensile strength was unchanged, while yield strength and fracture resistance were increased. The increase in fracture resistance was modest for the wrought base metals and substantial for the weld metal and the cast base metal. The carbon steels tested were sensitive to dynamic strain aging, and hence the strength and toughness was affected by both temperature and strain rate effects. The carbon steel base metal and welds exhibited ultimate tensile strength values at 288 C (550 F) that were greater than at room temperature. Furthermore, the ultimate tensile strength at 288 C (550 F) was lowered significantly by increased strain rate and, in the carbon steel base metals, increased strain rate also lowered the fracture resistance, substantially in the base metal of one pipe. In comparing these results to the IPIRG pipe test results to date, it was found that the trends of these tests agree well with the Subtask 1.2 quasi-static and dynamic pipe fracture experiments. Loads measured in the Subtask 1.1 pipe experiments were, however, somewhat higher than would have been expected by the trends observed in the laboratory tests.

739 (ORNL/TM–12296) **Evaluation of pressure sensing concepts: A technology assessment.** Shepard, R.L.; Thacker, L.H. Oak Ridge National Lab., TN (United States). Sep 1993. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001036. Source: OSTI; NTIS; GPO Dep.

Advanced distributed control systems for electric power plants will require more accurate and reliable pressure gauges than those now installed. Future developments in power plant control systems are expected to use digital/optical networks rather than the analog/electric data transmission used in existing plants. Many pressure transmitters now installed use oil filling to separate process fluids from the gauge mechanism and are subject to insidious failures when the oil leaks. Testing and maintenance of pressure channels occupy a disproportionately large amount of effort to restore their accuracy and verify their operability. These and similar concerns have prompted an assessment of a broad spectrum of sensor technologies to aid in selecting the most likely candidates for adaptation to power plant applications. Ten representative conventional and thirty innovational pressure sensors are described and compared. Particular emphasis is focused on two categories: Silicon-integrated pressure sensors and fiber-optic sensors, and both of these categories are discussed in detail. Additional attractive concepts include variable reluctance gauges and resonant structure gauges that may not require oil buffering from the process fluid.

740 (SAND–93-1745C) **United States Department of Energy projects related to reactor pressure vessel annealing optimization.** Rosinski, S.T.; Nakos, J.T. Sandia National Labs., Albuquerque, NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309237–1: International Atomic Energy Agency (IAEA) specialist meeting on irradiation embrittlement and optimization of annealing, Paris (France), 20-23 Sep 1993). Order Number DE93041142. Source: OSTI; NTIS; INIS; GPO Dep.

Light water reactor pressure vessel (RPV) material properties reduced by long-term exposure to neutron irradiation can be recovered through a thermal annealing treatment. This technique to extend RPV life, discussed in this report, provides a complementary approach to analytical methodologies to evaluate RPV integrity. RPV annealing has been successfully demonstrated in the former Soviet Union and on a limited basis by the US (military applications only). The process of demonstrating the technical feasibility of annealing commercial US RPVs is being pursued through a cooperative effort between the nuclear industry and the US Department of Energy (USDOE) Plant Lifetime Improvement (PLIM) Program. Presently, two projects are under way through the USDOE PLIM Program to demonstrate the technical feasibility of annealing commercial US RPVS, (1) annealing re-embrittlement data base development and (2) heat transfer boundary condition experiments.

741 (WAPD-T–2931) **Flow regimes and heat transfer in vertical narrow annuli.** Ulke, A.; Goldberg, I. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. Order Number DE94002346. Source: OSTI; NTIS; INIS; GPO Dep.

In shell side boiling heat exchangers narrow crevices that are formed between the tubes and the tube support structure provide areas for local thermal-hydraulic conditions which differ significantly from bulk fluid conditions. Understanding of the processes of boiling and dryout in flow restricted crevices can help in designing of tube support geometries to minimize the likelihood of tube support plate and tube corrosion observed in commercial power plant steam generators. This paper describes a one dimensional thermal-hydraulic model of a vertical crevice between a tube and a support plate with cylindrical holes. The annulus formed by the support plate hole and an eccentrically located tube has been represented by vertical strips. The formation, growth and collapse of a steam bubble in each strip has been determined. Based on the bubble history, and flow regimes characterized by "isolated" bubbles, "coalesced" bubbles and liquid deficient regions have been defined.

742 (WSRC–MS-93-479) **The effect of spacer ribs on Ledinegg type flow instabilities.** Coutts, D.A. Westinghouse Savannah River Co., Aiken, SC (United States). 9 Sep 1993. 388p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93041146. Source: OSTI; NTIS; GPO Dep.

Thesis submitted to the University of South Carolina, Columbia, SC.

An experimental program has been completed which evaluated the effect of a flow obstruction in a heated channel on the onset of flow instability (OBI). The test channel was rectangular (80 × 3 mm), heated on one surface, and equipped with view ports. Tests were conducted in a flow controlled mode at heat fluxes of 370 kW/M^2, and 610 kW/m^2. Direct comparisons were made between the demand curve minimum for the unobstructed channel and a channel equipped with a 2.07 mm wide rib that was parallel to the

flow and in contact with the heated surface. Data at OFI is presented in the nondimensional terms Of Q_{ratio} (ratio of heat flux applied to heat flux required to achieve saturated liquid conditions at the exit), and the local Stanton number at the channel exit for each channel arrangement. The Q_{ratio} and Stanton number values for the unobstructed channel and the rib equipped channel are then compared to produce an estimate of the rib effect.

2203 Fuel Elements

Refer also to citation(s) 759, 799, 1817

743 (CNIC–00657) **Simulation experiment for the U-H-Zr fuel element surface temperature measurement calibration in the outside of reactor.** Yang Huimin (Nuclear Power Inst. of China, Sichuan (China)); Jiang Xingying; Xiao Daiyun; Yang Laisheng. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 8p. (In Chinese). (SINRE–0035.). Order Number DE94604655. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of the test, which was carried out in the outside of the reactor, is to measure the surface temperature of the U-H-Zr fuel element. It is difficult to measure the surface temperature of fuel element in the inside of the reactor by thermocouple method, and the value measured by thermocouple method must be lower than actual value. Only by the simulation experiment in the outside of reactor finding the temperature modification coefficient, the actual accurate surface temperature can be obtained. This test was to simulate the actual thermohydraulic condition of the reactor core to obtain modification coefficient that could be directly used in the core of U-H-Zr reactor. The errors of measured fuel element surface temperature by using these modification coefficients are less than +- 5%.

744 (JAERI-M–93-103) **Design study of fuel fabrication and test facility and post-irradiation examination facility for the development of new type fuels.** Amano, Hidetoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Hasegawa, Keisuke; Yamahara, Takeshi; Suzuki, Yasufumi; Furuta, Teruo. Japan Atomic Energy Research Inst., Tokyo (Japan). May 1993. 81p. (In Japanese). Order Number DE94718743. Source: OSTI; NTIS; INIS.

Japan Atomic Energy Research Institute (JAERI) conducted a design study concerning the integrated test facilities for the future LWR technology where fuel irradiation tests, nuclear physics experiments, fuel manufacturing, post-irradiation examinations, reprocessing tests and other associated activities would be performed. Fuel engineering facilities, part of the integrated facilities, will consist of a fuel fabrication and test facility, a post-irradiation examination facility and a backend engineering facility. They will carry out fabrication and post-irradiation examinations of MOX fuel with high plutonium content for very high burnup (up to 100GWd/t) and minor actinide-bearing fuels, and also R and D works for backend technology including reprocessing tests on those new type fuels. This paper describes a fundamental concept, primary requisites and results of safety analyses of the fuel fabrication and test facility, and the post-irradiation examination facility. (author).

745 (JAERI-M–93-104) **Investigation of research and development subjects for very high burnup fuel: Development of fuel cladding materials.** Nagase, Fumihisa (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Suzuki, Masahide; Furuta, Teruo; Suzuki, Yasufumi; Hayashi, Kimio; Amano, Hidetoshi. Japan Atomic Energy Research Inst., Tokyo (Japan). May 1993. 124p. (In Japanese). Order Number DE94718748. Source: OSTI; NTIS; INIS.

Plutonium use as well as burnup extension of UO_2 fuel is an important subject for the strategy of utilization of the nuclear energy in LWRs. A higher burnup is favorable to MOX fuel in economic respect and for effective use of plutonium. Therefore, the concept of a 'very high burnup' aiming at the maximum bundle burnup of 100GWd/t has been proposed assuming use of MOX fuel. The authors have investigated research and development subjects for the fuel pellet and the cladding material to be developed. The present report shows the results on the cladding material. In order to achieve a very high burnup, development of the cladding material with higher corrosion and radiation resistance compared with Zircaloy is necessary. In this report, zirconium based alloy, stainless steel, nickel and titanium based alloys, ceramics, etc. were reviewed considering water corrosion resistance, thermal and mechanical properties, radiation effects, etc. Furthermore, capability of these materials as the fuel cladding was discussed focusing on water side corrosion and radiation effect on mechanical properties. As a result, candidate materials at present and the required research tasks were shown with issues for the development. (author) 66 refs.

746 (JAERI-M–93-122) **Preparation of source particles for fabricating pellets through sol-gel microsphere pelletization: Preparation of 50 μm class microspheres of ThO_2 and (Th, U)O_2.** Yamagishi, Shigeru (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Takahashi, Yoshihisa. Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 23p. (In Japanese). Order Number DE94718740. Source: OSTI; NTIS; INIS.

Size control conditions of source particles for fabricating pellets by sol-gel microsphere pelletization and drying conditions for obtaining soft source particles were studied. By using a gelation apparatus based on a vibration nozzle jetting sol drops horizontally, the drop formation conditions of nozzle diameters, sol feed rates, and vibration frequencies were studied for sol drop sizes of 170 $\approx$ 700 μm, corresponding to 50 $\approx$ 200 μm of sintered particles. The drying condition was examined for obtaining such fine source particles without sticking during removal of alcohol substituted for water in the gel particles. Examples of the particles prepared under the established conditions were shown for various U/(Th+U) ratios of 0 $\approx$ 30 mol%. (author).

747 (SAND–93-7080C) **An F2D analysis of the Flow Instability Test (FIT) experiment.** Suo-Anttila, A. Science Applications International Corp., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940101–6: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94001420. Source: OSTI; NTIS; GPO Dep.

The F2D code was used to analyze the Flow-Instability-Test (FIT) experiments at Brookhaven National Laboratories. A one-dimensional analysis of the experiment indicated that at the higher temperature levels the element should be unstable. The experimental data corroborated this theory. The two-dimensional simulation behaved in a manner that was very similar to the experimentally measured behavior. In conclusion, the FIT experimental analysis yields partial code validation of F2D, and it also validates the methodology that is used in analyzing thermal flow stability.

2204 Control Systems

Refer also to citation(s) 789

748 (ANL/RA/CP–79576) **Applications of pattern recognition techniques to online fault detection.** Singer, R.M. (Argonne National Lab., IL (United States)); Gross, K.C.; King, R.W. Argonne National Lab., IL (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9303221–4: Probabilistic safety assessment and management (PSAM) conference, San Diego, CA (United States), 20-24 Mar 1993). Order Number DE94002372. Source: OSTI; NTIS; GPO Dep.

A common problem to operators of complex industrial systems is the early detection of incipient degradation of sensors and components in order to avoid unplanned outages, to orderly plan for anticipated maintenance activities and to assure continued safe operation. In such systems, there usually are a large number of sensors (upwards of several thousand is not uncommon) serving many functions, ranging from input to control systems, monitoring of safety parameters and component performance limits, system environmental conditions, etc. Although sensors deemed to measure important process conditions are generally alarmed, the alarm set points usually are just high-low limits and the operator's response to such alarms is based on written procedures and his or

her experience and training. In many systems this approach has been successful, but in situations where the cost of a forced outage is high an improved method is needed. In such cases it is desirable, if not necessary, to detect disturbances in either sensors or the process prior to any actual failure that could either shut down the process or challenge any safety system that is present. Recent advances in various artificial intelligence techniques have provided the opportunity to perform such functions of early detection and diagnosis. In this paper, the experience gained through the application of several pattern-recognition techniques to the on-line monitoring and incipient disturbance detection of several coolant pumps and numerous sensors at the Experimental Breeder Reactor-II (EBR-II) which is located at the Idaho National Engineering Laboratory is presented.

749 (CNIC–00677) **A qualitative description of human error.** Li Zhaohuan (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy). China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 14p. (IAE–0113.). Order Number DE94604578. Source: OSTI; NTIS (US Sales Only); INIS.

The human error has an important contribution to risk of reactor operation. The insight and analytical model are main parts in human reliability analysis. It consists of the concept of human error, the nature, the mechanism of generation, the classification and human performance influence factors. On the operating reactor the human error is defined as the task-human-machine mismatch. The human error event is focused on the erroneous action and the unfavored result. From the time limitation of performing a task, the operation is divided into time-limited and time-opened. The HCR (human cognitive reliability) model is suited for only time-limited. The basic cognitive process consists of the information gathering, cognition/thinking, decision making and action. The human erroneous action may be generated in any stage of this process. The more natural ways to classify human errors are presented. The human performance influence factors including personal, organizational and environmental factors are also listed.

750 (CONF-9305215–2) **Qualification issues associated with the use of advanced instrumentation and control systems hardware in nuclear power plants.** Korsah, K. (Oak Ridge National Lab., TN (United States)); Antonescu, C. Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From IAEA specialists meeting on experience in ageing, maintenance and modernization of instrumentation and control systems for improving nuclear power plant availability; Rockville, MD (United States); 5-7 May 1993. Order Number DE94000488. Source: OSTI; NTIS; INIS; GPO Dep.

The instrumentation and control (I&C) systems in advanced reactors will make extensive use of digital controls, microprocessors, multiplexing, and Tiber-optic transmission. Elements of these advances in I&C have been implemented on some current operating plants. However, the widespread use of the above technologies, as well as the use of artificial intelligence with minimum reliance on human operator control of reactors, highlights the need to develop standards for qualifying I&C used in the next generation of nuclear power plants. As a first step in this direction, the protection system I&C for present-day plants was compared to that proposed for advanced light water reactors (ALWRs). An evaluation template was developed by assembling a configuration of a safety channel instrument string for a generic ALWR, then comparing the impact of environmental stressors on that string to their effect on an equivalent instrument string from an existing light water reactor. The template was then used to address reliability issues for microprocessor-based protection systems. Standards (or lack thereof) for the qualification of microprocessor-based safety I&C systems were also identified. This approach addresses in part issues raised in Nuclear Regulatory Commission policy document SECY-91-292. which recognizes that advanced I&C systems for the nuclear industry are "being developed without consensus standards, as the technology available for design is ahead of the technology that is well understood through experience and supported by application standards."

751 (DOE/OR/00033–T551) **An analysis of multiple particle settling for LMR backup shutdown systems.** Brock, R.W. (Illinois Univ., Urbana, IL (United States)). Oak Ridge Associated Universities, Inc., TN (United States); Illinois Univ., Urbana, IL (United States). May 1992. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000845. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to University of Illinois.

Backup shutdown systems proposed for future LMRs may employ discreet absorber particles to provide the negative reactivity insertion. When actuated, these systems release a dense packing of particles from an out-of-core region to settle into an in-core region. The multiple particle settling behavior is analyzed by the method of continuity waves. This method provides predictions of the dynamic response of the system including the average particle velocity and volume fraction of particles vs. time. Although hindered settling problems have been previously analyzed using continuity wave theory, this application represents an extension of the theory to conditions of unrestrained settling. Typical cases are analyzed and numerical results are calculated based on a semi-empirical drift-flux model. For 1/4-inch diameter boron-carbide particles in hot liquid sodium, the unrestrained settling problem assumes a steady-state solution when the average volume fraction of particles is 0.295 and the average particle velocity is 26.0 cm/s.

752 (DP–403) **Cooling of control rods in the Savannah River reactors: Progress report No. 2.** Abate, L.J. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Lab. Nov 1959. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001 ;AC09-89SR18035. (DP–403-TL). Order Number DE94001139. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Studies were continued of the conditions under which a control and in a Savannah River reactor will melt if the supply of forced-convection coolant to the heated channel is lost. In three experiments with electrically heated rods, burnout occurred at heat fluxes of 52,000 to 56,000 pcu/(hr)(ft^2) when the wall of the guide tube, or septifoil, was perforated in the manner designed to disperse the effluent from the septifoils evenly throughout the reactor tank. In tests reported earlier with unperforated septifoils, the corresponding burnout heat flux was 7,000 pcu/(hr)(ft^2) in the central channel of a septifoil and 31,000 pcu/(hr)(ft^2) in the central channel of a septifoil and 31,000 pcu/(hr)(ft^2) for a rod located in an outer channel.

753 (NUREG/CR–6090) **The Programmable Logic Controller and its application in nuclear reactor systems.** Palomar, J. (Lawrence Livermore National Lab., CA (United States)); Wyman, R. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Reactor Controls and Human Factors; Lawrence Livermore National Lab., CA (United States). Sep 1993. 92p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-48. (UCRL-ID–112900). Source: OSTI; NTIS; INIS; GPO.

This document provides recommendations to guide reviewers in the application of Programmable Logic Controllers (PLCS) to the control, monitoring and protection of nuclear reactors. The first topics addressed are system-level design issues, specifically including safety. The document then discusses concerns about the PLC manufacturing organization and the protection system engineering organization. Supplementing this document are two appendices. Appendix A summarizes PLC characteristics. Specifically addressed are those characteristics that make the PLC more suitable for emergency shutdown systems than other electrical/electronic-based systems, as well as characteristics that improve reliability of a system. Also covered are PLC characteristics that may create an unsafe operating environment. Appendix B provides an overview of the use of programmable logic controllers in emergency shutdown systems. The intent is to familiarize the reader with the design, development, test, and maintenance phases of applying a PLC to an ESD system. Each phase is described in detail and information pertinent to the application of a PLC is pointed out.

754 (PNL–8781) **Flux stability and power control in the Soviet RBMK-1000 reactors.** Meriwether, G.H.; McNeece, J.P. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 78p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-76RL01830. Order Number DE94000546. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the Chernobyl accident, the Soviets have studied and implemented various design changes to improve the safety of the RBMK reactors. The safety measurements include modifications of the control rod configuration, fuel enrichment increase from 2.0 to 2.4 weight percent U-235, and installation of additional supplemental absorbers. The purpose of this study is to investigate the effects of increased fuel enrichment, different control rod positions, and supplemental absorber loadings on reactivity control, power distribution within the large RBMK core, and relative stability against power oscillations.

2205 Environmental Aspects

Refer also to citation(s) 672, 784, 805, 1379, 1975

755 (CEA-CONF–11522) **Radioecological monitoring of the environment of a French nuclear power plant after 12 years in operation.** Foulquier, L. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations); Descamps, B.; Roussel, S.; Daumas, J. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604434. Source: OSTI; NTIS (US Sales Only); INIS.

Taking Fessenheim Nuclear Power Plant as an example, this paper gives a description of various types of environmental test carried out under the responsibility of the Operator of Nuclear Power Plants in France: permanent monitoring of radioactivity, periodic radioecological assessments. The main results of measurements taken, show the effect of the Plant to be negligible. 8 refs., 1 fig., 4 tabs.

756 (CONF-931160–21) **Iodine evolution and pH control.** Beahm, E.C.; Lorenz, R.A.; Weber, C.F. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94000471. Source: OSTI; NTIS; INIS; GPO Dep.

pH is the major factor in determining the extent of I_2 in solution. In containment where no pH-control chemicals are present, the acidity or basicity of the water pool will be determined by materials that are introduced into containment as a result of the accident itself. These materials may be fission products (i.e., cesium compounds), thermally produced products (i.e., core-concrete aerosols), or compounds produced by radiation (i.e., nitric acid). In situations where pH levels fall below ~7, the formation of I_2 will occur in irradiated iodide solutions. A correlation between pH and iodine formation is needed so that the amounts I_2 in water pools can be assessed. This, in turn, determines the amount of I_2 in the atmosphere available for escape by containment leakage. A number of calculational routines based on more than 100 differential equations representing individual reactions can be found in the literature. In this work, it is shown that a simpler approach based on the steady-state decomposition of hydrogen peroxide should correctly describe iodine formation in severe accidents. Comparisons with test data show this approach to be valid. The most important acids in containment will be nitric acid (HNO_3), produced by irradiation of water and air, and hydrochloric acid (HCl), produced by irradiation or heating of electrical cable insulation. The most important bases in containment will be cesium hydroxide, cesium borate (or cesium carbonate), and in some plants pH additives, such as sodium hydroxide or sodium phosphate.

757 (LA-UR–93-3007) **Analysis of rockfall hazards at Los Alamos National Laboratory.** McLin, S.G. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310102–14: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93040128. Source: OSTI; NTIS; GPO Dep.

In the early years at Los Alamos National Laboratory, rockfall hazards were intuitively recognized and avoided. Hence mesa tops were selected over canyon floors for construction sites, although some canyon bottoms were still used. The Omega West reactor site was located in a narrow portion of Los Alamos Canyon adjacent to 400 foot high vertical cliffs. In 1944, a quarter-mile long rock catcher was installed above the reactor to protect the facility from occasional rockfalls. In addition, an annual rock catcher inspection was initiated. Between 1944 and 1993, 24 separate rockfall events were documented; individual rocks trapped in the catcher ranged in size from 300 to 21,000 pounds. These rockfall inspection data were arranged into an annual exceedance series, and a frequency analysis was performed. This type of analysis is routinely employed in flood studies when stream gaging records are available. Prior to this study, however, such techniques had never been used with rockfall data. This analysis indicates that the annual rockfall series is approximately log-normally distributed, and that the 500-year rockfall event will probably exceed 187 tons. In addition, a Markov generation scheme, which preserves the statistics of observed logarithms from the historical data, was used to generate a synthetic rockfall series. These synthetic data suggest that the cliff face will retreat at an average rate approximating 2 to 3 centimeters per 1000 years. This rate is comparable to independently computed rates that range from 4 to 14 centimeters per 1000 years. These cliff-face erosion processes are important because they affect mesa-top trench burial operations of low-level radioactive wastes.

758 (NUREG/CR–2907-Vol.11) **Radioactive materials released from nuclear power plants: Volume 11: Annual report, 1990.** Tichler, J. (Brookhaven National Lab., Upton, NY (United States)); Doty, K.; Congemi, J. Nuclear Regulatory Commission, Washington, DC (United States). Office of Information Resources Management; Brookhaven National Lab., Upton, NY (United States). Oct 1993. 351p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–51581-Vol.11). Source: OSTI; NTIS; INIS.

Releases of radioactive materials in airborne and liquid effluents from commercial light water reactors during 1990 have been compiled and reported. Data on solid waste shipments as well as selected operating information have been included. This report supplements earlier annual reports issued by the former Atomic Energy Commission and the Nuclear Regulatory Commission. The 1990 release data are summarized in tabular form. Data covering specific radionuclides are summarized.

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 182, 359, 377, 680, 725, 748, 752, 779, 797, 798, 799, 800, 801, 804, 806, 1424, 1744, 2803

759 (ANL/NPR–93/002) **Evaluation of existing technology base for candidate fuels for the HWR-NPR: New Production Reactors Program.** Snelgrove, J.L. (Argonne National Lab., IL (United States)); Hofman, G.L.; Frontroth, R.L.; McDonnell, W.R.; Peacock, H.B.; Whitacre, R.F.; Copeland, G.L. Argonne National Lab., IL (United States). Feb 1993. 428p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94002408. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Fabrication, properties, and irradiation performance data have been compiled and evaluated for the following aluminum-base fuels considered for use in a new heavy water-moderated production reactor: U-Al alloy, U_3O_8 dispersion, UAl_x dispersion, and U_3Si_2 dispersion. The focus of this work was the data needed for reactor design; however, information is also included on the fuel behavior under accident conditions. In particular, the exothermic reaction of U_3O_8 and aluminum is discussed in some detail.

760 (CONF-9306234–1) **The distribution sphere model.** Myers, B.F.; Montgomery, F.C.; Morris, R.N. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International Atomic Energy Agency (IAEA) coordinated research

program (CRP2); Vienna (Austria); 23-25 Jun 1993. Order Number DE93018722. Source: OSTI; NTIS; GPO Dep.

The equivalent sphere model, which is widely used in calculating the release of fission gases from nuclear fuel, is idealized. The model is based on the diffusion of fission products in and their escape from a homogeneous sphere of fuel; the fission products are generated at a constant rate and undergo radiodecay. The fuel is assumed to be a set of spherical particles with a common radius. The value of the radius is such that the surface-to-volume ratio, S/V, of the set of spherical particles is the same as the S/V of the fuel mass of interest. The release rate depends on the dimensionless quantity $\lambda a^2/D$ where λ is the radiodecay constant, a, the equivalent sphere radius and D, the diffusion coefficient. In the limit $\lambda t \gg 1$, the steady-state fractional release for isotopes with half-lives less than about 5 d is given by the familiar relation $R/B = 3\sqrt{D/\lambda a^2}$ (1). For the spherical particles, S/V = 3/a. However, in important cases, the assumption of a single value of a is inappropriate. Examples of configurations for which multiple values of a are appropriate include powders, hydrolyzed fuel kernels, normally configured HTR fuel particles and perhaps, fuel kernels alone. In the latter case, one can imagine a distribution of values of a whose mean yields the value appropriate for agreement of Eq. (1) with measurement.

761 (CONF-9310102–32) **Fracture fragility of HFIR vessel caused by random crack size or random toughness.** Chang, Shih-Jung; Proctor, L.D. Oak Ridge National Lab., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993. Order Number DE94002436. Source: OSTI; NTIS; INIS; GPO Dep.

This report discuses the probability of fracture (fracture fragility) versus a range of applied hoop stresses along the HFIR vessel which is obtained as an estimate of its fracture capacity. Both the crack size and the fracture toughness are assumed to be random variables that follow given distribution functions. Possible hoop stress is based on the numerical solution of the vessel response by applying a point pressure-pulse it the center of the fluid volume within the vessel. Both the fluid-structure interaction and radiation embrittlement are taken into consideration. Elastic fracture mechanics is used throughout the analysis. The probability of vessel fracture for a single crack caused by either a variable crack depth or a variable toughness is first derived. Then the probability of fracture with multiple number of cracks is obtained. The probability of fracture is further extended to include different levels of confidence and variability. It, therefore, enables one to estimate the high confidence and low probability capacity accident load.

762 (DOE/SR/18035–T1-Exec.Summ.) **New production reactor flow instability experiments with coolant upflow: Executive summary.** Ohrn, T.R. (Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div.); Privette, R.M. Westinghouse Savannah River Co., Aiken, SC (United States); Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div. Apr 1992. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93019363. Source: OSTI; NTIS (US Sales Only); GPO Dep.

To support the design effort for the Heavy Water, New Production Reactor (NPR), thermal-hydraulic data at the unique low pressure and temperature conditions of the NPR was required. The data are needed for benchmarking of predictive computer models that are used in the design safety analysis. Confirmatory tests were performed at the Babcock & Wilcox (B&W) Alliance (Ohio) Research Center using a single annular fuel assembly with coolant upflow. The test fuel assembly was an electrically heated, full-scale model of the Savannah River Site (SRS) Mark 22 fuel assembly. Detailed thermal-hydraulic data were obtained as the model fuel assembly was subjected to simulated design basis loss-of-coolant accident (LOCA) conditions, as well as during natural circulation and pool boiling conditions that may lead to heated wall dryout. Model fuel assembly response at conditions where flow instability occurs was found to be mild relative to previous results for a similar fuel assembly tested with coolant downflow. Effective two-phase cooling was demonstrated under decay-power conditions with and without bulk coolant circulation. This executive summary provides an overview of the NPR Upflow Test Program.

763 (DOE/SR/18035–T1-Vol.3) **New production reactor flow instability experiments with coolant upflow: Volume 3, Uncertainty analysis.** Walters, T.W. (Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div.). Westinghouse Savannah River Co., Aiken, SC (United States); Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div. Apr 1992. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93019374. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The presentation of engineering data from a test program is incomplete without a discussion and definition of the uncertainty associated with the engineering data values. The database generated from the New Production Reactor (NPR) Upflow Test Program performed at B&W's Alliance Research Center provided the basis for test analyses and computer code benchmarking by the Westinghouse Savannah River Company (WSRC). This report addresses the data uncertainty for the tests conducted at the facility from May 1991 through January 1992. The objective of this report is to define the nominal uncertainty associated with each engineering data value included in the program. With more than 50 million data points acquired during the test program, it is impractical to characterize the uncertainty for each value. To bound this task, the discussion presented in this document provides the user with the information needed to assess the nominal uncertainty for each database entry. For example, uncertainties are defined for an engineering value as simple as a temperature measurement from a thermocouple to more complex entries, such as the mass flow rate through three venturis that requires a number of instrument inputs and uncertainties for each to develop the uncertainty model. There will be isolated database entries that exceed the uncertainty presented in this document. However, the user of the database should be aware of the nominal uncertainty in the majority of the entries so that more information will not be interpreted from the data than can confidently be inferred based on the uncertainty analysis.

764 (ETDE-IT–93-221) **Microdosimetry study of radiobiological facilities at RSV-Tapiro reactor.** Pihet, P. (Universitaet des Saarlandes, Homburg (Germany)); Coppola, M.; Di Majo, V.; Loncol, T. 1992. 11p. (CONF-9209414–1: 11. symposium of microdosimetry, Gatlinnburg, TN (United States), 13-18 Sep 1992). Order Number DE94716514. Source: OSTI; NTIS (US Sales Only).

The irradiation facility existing at the RSV-TAPIRO fast reactor of the ENEA (Italian Agency for Energy, New Technologies and the Environment) Casaccia Center is routinely employed by ENEA laboratories and associated groups for radiobiological experiments with fission spectrum neutrons. Current research includes experimental carcinogenesis studies in vitro and in vivo. The standard biological facility consists of one vertical channel, 10 cm in diameter, through which the samples to be irradiated can be shipped down to a position within a copper reflector near the reactor core. Recently, a new irradiation facility has been designed in order to perform irradiation of larger sized samples. The new design raised the problem of differences in radiation quality between the standard and new facilities, and therefore micro-dosimetric investigations were performed to provide a quantitative assessment of radiation quality and an experimental check of the calculated fluence spectra. Microdosimetric measurements were carried out in the different field configurations using small 1/2 Rossi counters. At the new facility, measurements were performed at different distances from the reflector and the large field was scanned. The microdosimetric characteristics at the two facilities were compared in terms of energy distributions and the related averaged quantities yF and yD for the total field and the neutron component. The energy deposition spectra were computed using the neutron fluence data as a primary field characteristics and comparing the influence of different components of the energy spectra. First results indicate an overall good agreement between calculated and measured energy spectra. Radiation quality was assessed using different approaches, such as the y^* parameter from the formalism of the Dual Radiation Action Theory.

765 (HAN–27115) **Events of importance for week ending June 29, 1949, Hanford Operations Office, Richland, Washington.** Schlemmer, F.C. USAEC Hanford Operations Office, Richland, WA (United States). 29 Jun 1949. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001618. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report details events of importance as reported by the Hanford Operations Office for the week ending June 29, 1949.

766 (HW–7-991-Del.) **Hanford Engineering Works monthly report, November 1944.** Simon, W.O. Hanford Works, Richland, WA (United States). 10 Dec 1944. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001617. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report details activities of the Hanford Engineer Works during the month of November 1944.

767 (HW–10307) **Conversations regarding RW.** Gast, P.F. Hanford Works, Richland, WA (United States). 6 Jul 1948. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001141. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. TANTALUM/production; HANFORD PRODUCTION REACTORS/reactor operation; TANTALUM; PRODUCTION; REACTOR SAFETY; URANIUM 235; TEMPERATURE COEFFICIENT; REACTOR FUELING

768 (HW–10339) **Production of Ta^{182}.** Gast, P.F. Hanford Works, Richland, WA (United States). 8 Jul 1948. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001140. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum discusses briefly and approximately the two extreme programs which could be followed in the production of Ta^{182}: the use of present available excess reactivity, and the use of a pile, continuing no U^{238}, expressly to produce Ta^{182}. Use of lesser amounts of enriched material would achieve lesser production rates. The cost in fissionable material per gram of active isotope would remain approximately the same.

769 (INIS-BR–3174, pp. 19-28) **Measurement of thermal, epithermal and fast neutrons fluxes by the activation foil method at IEA-R1 reactor.** Dias, M.S. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Koskinas, M.F.; Berretta, J.R.; Fratin, L.; Botelho, S.; Goncalez, O.L.; Hinostroza, H. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

The thermal, epithermal and fast neutron fluxes have been determined experimentally by the activation foil method at position GI, located near the IEA-R1 reactor core. The reactions used were ^{197}Au (n,gamma) ^{198}Au, for thermal and epithermal neutrons and ^{27}Na (n,alpha)^{24}Na, for fast neutrons. The activities were measured by the $4\pi(PC)\beta$-γ coincidence method. (author).

770 (INIS-mf–13731, pp. 294) **Neutron spectra profile in beam ports of a triga Mark III experimental reactor.** Balcazar, M. (Instituto Nacional de Investigaciones Nucleares (Mexico)); Delfin, A.; Camacho, M.E.; Mazon, R.; Lavera, L. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SPECTRA/triga-3-salazar reactor; BEAM HOLES; BEAM PROFILES; DIELECTRIC TRACK DETECTORS; RADIATION DOSE DISTRIBUTIONS

771 (JAERI-M–93-068) **Color temperature evaluation in fuel behavior observation tests in NSRR.** Nakamura, Takehiko (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Yoshinaga, Makio; Saito, Sinzo; Emori, Yasubumi; Nanba, Hisao. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1993. 42p. (In Japanese). Order Number DE94718754. Source: OSTI; NTIS; INIS.

Fuel behavior under reactivity initiated accident and severe accident conditions have been studied in the NSRR. The cladding surface temperature is measured by thermocouples as an important indicator of the fuel behavior in the tests. However, when the cladding temperature exceeds 2,000K, the thermocouples generally fail and the subsequent temperature histories are not able to be measured. A color temperature evaluation method was successfully applied to the NSRR tests in which fuel behavior was recorded on color films. The temperature distributions on the cladding surface of the fuel rods which were hardly known by a few sets of thermocouples were obtained, as well as the temperature histories after the thermocouple failure by the evaluation. (author).

772 (PNL-SA–22755) **N Reactor Lessons Learned workshop.** Heaberlin, S.W. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9307148–1: N reactor lessons learned workshop, Richland, WA (United States), 20-22 Jul 1993). Order Number DE94001669. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a workshop designed to introduce participants to a process, or model, for adapting LWR Safety Standards and Analysis Methods for use on rector designs significantly different than LWR. The focus of the workshop is on the "Lessons Learned" from the multi-year experience in the operation of N Reactor and the efforts to adapt the safety standards developed for commercial light water reactors to a graphite moderated, water cooled, channel type reactor. It must be recognized that the objective of the workshop is to introduce the participants to the operation of a non-LWR in a LWR regulatory world. The total scope of this topic would take weeks to provide a through overview. The objective of this workshop is to provide an introduction and hopefully establish a means to develop a longer term dialogue for technical exchange. This report provides outline of the workshop, a proposed schedule of the workshop, and a description of the tasks will be required to achieve successful completion of the project.

773 (UNI–138) **Annual report of N Reactor operating experience pertinent to nuclear safety – CY-1973.** Deobald, T.L. (comp.). United Nuclear Industries, Inc., Richland, WA (United States). 15 Feb 1974. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93040694. Source: OSTI; NTIS; GPO Dep.

This report is submitted to meet the requirements for annual reporting to the Commission of N Reactor operating experience pertinent to reactor safety. Those CY-1973 accomplishments and experiences cited below have been selected as being responsive to the Reference 1 document.

2209 Reactor Safety

Refer also to citation(s) 681, 682, 684, 690, 691, 703, 704, 705, 706, 707, 734, 737, 750, 751, 754, 756, 762, 763, 767, 773, 996, 1953, 2199

774 (ANL/ET/CP–81036) **Results of examinations of pressure vessel samples and instrument nozzles from the TMI-2 lower head.** Korth, G.E. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Diercks, D.R.; Neimark, L.A. Argonne National Lab., IL (United States). Oct 1993. 28p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States); Organization for Economic Cooperation and Development, 75 - Paris (France). DOE Contract W-31109-ENG-38. (CONF-931079–5: Water reactor safety information meeting, Bethesda, MD (United States), 25-27 Oct 1993). Order Number DE94002375. Source: OSTI; NTIS; INIS; GPO Dep.

Fifteen prism-shaped steel samples were removed from the lower head of the damaged TMI-2 reactor pressure vessel to assess the effects of approximately 19 metric tons of molten core debris that had relocated there during the 1979 loss-of-coolant accident. Metallographic examinations of the samples revealed that

inside surface temperatures of 800 to 1,100°C were attained during the accident in an elliptical shaped "hot spot" ≈1 × 0.7 m. Tensile, creep, and Charpy V-notch specimens were also cut from the samples to assess the mechanical properties of the lower head material at temperatures up to the peak accident temperature. These properties were used in a margin to failure analysis of the lower head. Examinations of instrument nozzles removed from the lower head region assisted in defining the relocation scenario of the molten core debris and showed that the lower head was largely protected from catastrophic failure by a solidified layer around the molten core debris that acted as a partial thermal insulator.

775 (ANL/RE/CP–78893) **Results of direct containment heating integral experiments at 1/40th scale at Argonne National Laboratory.** Binder, J.L.; McUmber, L.M.; Spencer, B.W. Argonne National Lab., IL (United States). [1993]. 24p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931079–3: Water reactor safety information meeting, Bethesda, MD (United States), 25-27 Oct 1993). Order Number DE93041175. Source: OSTI; NTIS; INIS; GPO Dep.

A series of integral tests have been completed that investigate the effect of scale and containment atmosphere initial composition on Direct Containment Heating (DCH) phenomena at 1/40 linear scale. A portion of these experiments were performed as counterparts to integral experiments conducted at 1/10th linear scale at Sandia National Laboratories. The tests investigated DCH phenomena in a 1/40th scale mockup of Zion Nuclear Power Plant geometry. The test apparatus was a scaled down version of the SNL apparatus and included models of the reactor vessel lower head, containment cavity, instrument tunnel, lower subcompartment structures and the upper dome. A High Pressure Melt Ejection (HPME) was produced using steam as a blowdown gas and iron-alumina thermite with chromium as a core melt simulant. The results of the counterpart experiments indicated no effect of scale on debris/gas heat transfer and debris metal oxidation with steam. However, the tests indicated a slight effect of scale on hydrogen combustion, the results indicating slightly more efficient combustion with increasing scale. The experiments demonstrated the effectiveness of the subcompartment structures in trapping debris exiting the cavity and preventing it from reaching the upper dome. The test results also indicated that a 50% air – 50% steam atmosphere prevented hydrogen combustion. However, a 50% air - 50% nitrogen did not prevent hydrogen combustion in a HPME with all other conditions being nominally the same.

776 (BNL-NUREG–49116) **Enhanced human performance of utility maintenance programs.** Fresco, A.; Haber, S.; O'Brien, J. Brookhaven National Lab., Upton, NY (United States). [1993]. 5p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930807–7: 16. reactor operations international topical meeting, Long Island, NY (United States), 15-18 Aug 1993). Order Number DE93019126. Source: OSTI; NTIS; INIS; GPO Dep.

Assuring the safe operation of a nuclear power plant depends, to a large extent, on how effectively one understands and manages the aging-related degradation that occurs in structures, systems, and components (SSCs). Aging-related degradation is typically managed through a nuclear plant's maintenance program. A review of 44 Maintenance Team Inspection (MTI) Reports indicated that while some plant organizations appeared to assume a proactive mode in preventing aging-related failures of their SSCs important to safety, others seemed to be taking a passive or reactive mode. Across all plants, what is clearly needed, is a strong recognition of the importance of aging-related degradation and the use of existing organizational assets to effectively detect and mitigate those effects. Many of those assets can be enhanced by the consideration of organizational and management factors necessary for the implementation of an effective aging management program. This report provides a discussion of this program.

777 (CONF-931079–6) **Interpretation of the results of the CORA-33 dry core BWR test.** Ott, L.J. (Oak Ridge National Lab., TN (United States)); Hagen, S. Oak Ridge National Lab., TN (United States). [1993]. 56p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From Water reactor safety information meeting; Bethesda, MD (United States); 25-27 Oct 1993. Order Number DE94002490. Source: OSTI; NTIS; INIS; GPO Dep.

All BWR degraded core experiments performed prior to CORA-33 were conducted under "wet" core degradation conditions for which water remains within the core and continuous steaming feeds metal/steam oxidation reactions on the in-core metallic surfaces. However, one dominant set of accident scenarios would occur with reduced metal oxidation under "dry" core degradation conditions and, prior to CORA-33, this set had been neglected experimentally. The CORA-33 experiment was designed specifically to address this dominant set of BWR "dry" core severe accident scenarios and to partially resolve phenomenological uncertainties concerning the behavior of relocating metallic melts draining into the lower regions of a "dry" BWR core. CORA-33 was conducted on October 1, 1992, in the CORA tests facility at KfK. Review of the CORA-33 data indicates that the test objectives were achieved; that is, core degradation occurred at a core heatup rate and a test section axial temperature profile that are prototypic of full-core nuclear power plant (NPP) simulations at "dry" core conditions. Simulations of the CORA-33 test at ORNL have required modification of existing control blade/canister materials interaction models to include the eutectic melting of the stainless steel/Zircaloy interaction products and the heat of mixing of stainless steel and Zircaloy. The timing and location of canister failure and melt intrusion into the fuel assembly appear to be adequately simulated by the ORNL models. This paper will present the results of the posttest analyses carried out at ORNL based upon the experimental data and the posttest examination of the test bundle at KfK. The implications of these results with respect to degraded core modeling and the associated safety issues are also discussed.

778 (CONF-9310102–18) **Evaluation of wind/tornado-generated missile impact.** Singhal, M.K.; Walls, J.C. Oak Ridge National Lab., TN (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993. Order Number DE93040602. Source: OSTI; NTIS; GPO Dep.

Simplified empirical formulae and some tabular data for the design/evaluation of structure barriers to resist wind/tornado generated missiles impact are presented in this paper. The scope is limited to the missiles defined by UCRL-15910 which are to be considered for moderate and high hazard facilities only. The method presented herein are limited to consideration of local effects on the barrier, i.e., the barrier must be capable of stopping the missile, and the barrier must no cause the generation of secondary missiles due to scabbing. Overall structural response to missile impact and structural effects derived from wind pressure are not addressed in this paper.

779 (CONF-931160–18) **Plant protection system optimization studies to mitigate consequences of large breaks in the Advanced Neutron Source Reactor.** Khayat, M.I. (Oak Ridge Inst. for Science and Education, TN (United States)); March-Leuba, J. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94000487. Source: OSTI; NTIS; INIS; GPO Dep.

Extended abstract.

This paper documents some of the optimization studies performed to maximize the performance of the engineered safety features and scram systems to mitigate the consequences of large breaks in the primary cooling system of the Advanced Neutron Source (ANS) Reactor.

780 (ETDE-IT–93-234) **Blowdown tests on automatic depressurization system of AP-600 reactor.** Villani, A. (ENEA, Casaccia (Italy). Area Energetica); Kropp, C.A.; Incalcaterra, P.; Proto, G. 1992. 6p. (CONF-921003–14: ANP'92: international conference on design and safety of advanced nuclear power plants, Tokyo (Japan), 25-29 Oct 1992). Order Number DE94716555. Source: OSTI; NTIS (US Sales Only).

The automatic depressurization function is a key safety feature of the AP-600 reactor because its actuation allows the proper initiation

and continuous operation of the long-term gravity injection system for passive reflooding and core cooling. This function could be obtained by introducing automatic depressurization valves in PWR NPPs and performance testings, in order to qualify their operation for extended blowdown of reactor coolant fluids. Most of these tests and qualification activities are in progress at the VAPORE (Valve and Pressurizer Operation Related Experiment) facility located in Casaccia - ENEA, (Italian Agency for Energy, New Technologies and Environment, Rome, Italy) and are being carried out within the frame work of a Technical Cooperation Agreement (TCA), signed in December 1990 among ENEA, SOPREN/ANSALDO and WESTINGHOUSE, for the development and design of passive components and systems for the AP - 600 Reactor. In the paper, after a brief introduction on the scope and program of tests, a general description of the VAPORE facility and its modifications for ADS testing are given together with some results from shakedown and commissioning test data, obtained in February, 1992.

781 (ETDE-IT–93-235) **Design and experimental verification of isolation condenser and passive containment cooler for SBWR.** Villani, A. (ENEA, Casaccia (Italy). Area Nucleare); Magris, F.; Medich, C.; Bolognini, M. 1992. 7p. (CONF-921003–13: ANP'92: international conference on design and safety of advanced nuclear power plants, Tokyo (Japan), 25-29 Oct 1992). Order Number DE94716556. Source: OSTI; NTIS (US Sales Only).

Two key systems of the SBWR. the advanced passive BWR reactor being developed by General Electric in a joint effort with an International team, are the Isolation Condenser System (ICS) and the Passive Containment Cooling System (PCCS). Both systems are safety related and 'passive' to the extent that they rely completely on passive components to perform their functions (respectively control of reactor pressure and containment pressure) for 72 hours without operator actions, the transfer of residual decay heat outside the containment depending solely on natural circulation condensing heat exchangers immersed in a water pool vented to the atmosphere. The Isolation Condenser (IC) and Passive Containment Cooler (PCC) have basically the same geometry, but they differ in the material selection and have different sizes, number of tubes and thickness, depending on the operating conditions they are intended to face. The paper presents the original design of the ICS and PCCS heat exchangers, on the basis of the severe functional requirements; outlines the main structural problems; and describes the test campaign on full-scale prototypical units to demonstrate the functional and structural adequacy of the components.

782 (ETDE-IT–93-242) **Description of automatic depressurization system test for AP-600 reactor at vapore facility.** Incalcaterra, P. (ENEA, Casaccia (Italy). Area Energetica); Kropp, C.A. 1993. 19p. (CONF-9304123–2: 8. Korean Atomic Industrial Forum/Korean Nuclear Society/OKAEA annual conference, Seoul (Korea, Republic of), 20-21 Apr 1993). Order Number DE94716594. Source: OSTI; NTIS (US Sales Only).

The automatic depressurization function is a key safety feature of the AP-600 Reactor because its actuation allows the proper initiation and continuous operation of the long-term gravity injection system for passive reflood and core cooling. This function is being verified by performance testing of the automatic depressurization valves, in order to qualify their operation for extended blowdown of reactor coolant fluids. Most of these tests and qualification activities are in progress at the VAPORE (VAlve and Pressurizer Qperation Related Experiment) facility located in Casaccia - ENEA, Energy Research Center (Rome, Italy) and are being carried out within the framework of a Technical Cooperation Agreement (TCA), signed in December 1990 among ENEA, SOPREN/ANSALDO and WESTINGHOUSE, for the development and design of passive components and systems for the AP - 600 Reactor. Recently (second half of 1992) ENEL, the Italian national utility, has joined the TCA. In the paper, after a short discussion on the scope and program of tests, a general description of the VAPORE facility and its modifications for Automatic Depressurization System (ADS) testing will be provided together with some results from shakedown and commissioning test data, obtained in February 1992 and updated information on activities performed during the Phase A of tests, completed in December 1992.

783 (INIS-mf–13522) **The safety of nuclear sites.** Moroccan-French cooperation in nuclear safety. Ministere de l'Energie et des Mines, Rabat (Morocco). Direction de l'Energie. Nov 1988. 193p. (CONF-8811217–: Maroco-French cooperation in nuclear safety, Rabat (Morocco), 28 Nov - 3 dec 1988). Order Number DE93624533. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

784 (KIYal–92-12) **Some aspects of consequences of environment radioactive contamination after Chernobyl accident (as illustrated by Ovruch district, Zhitomir region).** AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 29p. Order Number DE93623464. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

785 (NUREG–0090-Vol.16-No.2) **Report to Congress on abnormal occurrences, April–June 1993: Volume 16, No. 2.** Nuclear Regulatory Commission, Washington, DC (United States). Office for Analysis and Evaluation of Operational Data. Sep 1993. 20p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence as an unscheduled incident or event that the Nuclear Regulatory Commission determines to be significant from the standpoint of public health and safety and requires a quarterly report of such events to be made to Congress. This report covers the period April through June 1993, and discusses four abnormal occurrences at NRC-licensed facilities, three involving medical brachytherapy misadministrations and one involving a research reactor that operated without a safety system. One pool irradiation facility contamination event, two medical misadministrations (one "sodium iodide" and one brachytherapy), and one industrial radiographer overexposure event that were reported by NRC Agreement States are also discussed. The report also contains information updating one previously reported abnormal occurrence and information on three other events of interest.

786 (NUREG–0847-Suppl.12) **Safety Evaluation Report related to the operation of Watts Bar Nuclear Plant, Units 1 and 2.** Tam, P.S. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Reactor Regulation. Oct 1993. 56p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Supplement No. 12 to the Safety Evaluation Report for the application filed by the Tennessee Valley Authority for license to operate Watts Bar Nuclear Plant, Units 1 and 2, Docket Nos. 50-390 and 50-391, located in Rhea County, Tennessee, has been prepared by the Office of Nuclear Reactor Regulation of the Nuclear Regulatory Commission. The purpose of this supplement is to update the Safety Evaluation of (1) additional information submitted by the applicant since Supplement No. 11 was issued, and (2) matters that the staff had under review when Supplement No. 11 was issued.

787 (NUREG–1449) **Shutdown and low-power operation at commercial nuclear power plants in the United States: Final report.** Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Reactor Regulation. Sep 1993. 182p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The report contains the results of the NRC Staff's evaluation of shutdown and low-power operations at US commercial nuclear power plants. The report describes studies conducted by the staff in the following areas: Operating experience related to shutdown and low-power operations, probabilistic risk assessment of shutdown and low-power conditions and utility programs for planning and conducting activities during periods the plant is shut down. The report also documents evaluations of a number of technical issues regarding shutdown and low-power operations performed by the staff, including the principal findings and conclusions. Potential new regulatory requirements are discussed, as well as potential changes in NRC programs. A draft report was issued for comment in February 1992. This report is the final version and includes the responses to the comments along with the staff regulatory analysis of potential new requirements.

788 (NUREG–1453) **Regulatory Analysis for the resolution of Generic Issue 142: Leakage through electrical isolators in instrumentation circuits.** Rourk, C.J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution. Sep 1993. 13p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Generic Issue (GI) 142 deals with staff concerns about the design of isolation devices used to ensure separation between Class 1E and non-Class 1E electrical control and instrumentation circuits. This issue was initiated in June 1987. Staff reviews of the implementation of the Safety Parameter Display System (SPDS) requirement indicated that some isolation devices used to provide an interface between the non-Class 1E SPDS and the Class 1E safety systems would allow signal leakage if electrically challenged. It was unknown if the amount of leakage posed a hazard to safe operation of the Class 1E system. A review of failure records does not reveal any incidents of system damage caused by isolation device challenge. Furthermore, a review of existing PRA data indicates that the safety significance of ID challenge is low, at the expected challenge event frequency. However, based upon the potential design variations in future control systems resulting from application of computer technology, additional design and qualification test requirements for future plants are recommended.

789 (NUREG–1472) **Regulatory analysis for the resolution of generic issue 57: Effects of Fire Protection System Actuation on Safety-Related Equipment.** Woods, H.W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution. Oct 1993. 29p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Actuation of Fire Protection Systems (FPS) in Nuclear Power Plants have resulted in adverse interactions with equipment important to safety. Precursor operational experience has shown that 37% of all FPS actuations damaged some equipment, and 20% of all FPS actuations have resulted in a plant transient and reactor trip. On an average 0.17 FPS actuations per reactor year have been experienced in nuclear power plants in this country. This report presents the regulatory analysis for GI-57, "Effects of Fire Protection System Actuation on Safety-Related Equipment". The risk reduction estimates, cost/benefit analyses, and other insights gained during this effort have shown that implementation of the recommendations contained in this report can significantly reduce risk, and that these improvements can be warranted in accordance with the backfit rule, 10 CFR 50.109(a)(3). However, plant specific analyses are required in order to identify such improvements. Generic analyses can not serve to identify improvements that could be warranted for individual, specific plants. Plant specific analyses of the type needed for this purpose are underway as part of the Individual Plant Examination of External Events (IPEEE) program.

790 (NUREG/CP–0129) **Workshop on Program for Elimination of Requirements Marginal to Safety: Proceedings.** Dey, M. (Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution); Arsenault, F.; Patterson, M.; Gaal, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution; SCIENTECH, Inc., Rockville, MD (United States). Sep 1993. 185p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CONF-9304210–: Workshop on program for elimination of requirements marginal to safety, Bethesda, MD (United States), 27-28 Apr 1993). Source: OSTI; NTIS; INIS; GPO.

These are the proceedings of the Public Workshop on the US Nuclear Regulatory Commission's Program for Elimination of Requirements Marginal to Safety. The workshop was held at the Holiday Inn, Bethesda, on April 27 and 28, 1993. The purpose of the workshop was to provide an opportunity for public and industry input to the program. The workshop addressed the institutionalization of the program to review regulations with the purpose of eliminating those that are marginal. The objective is to avoid the dilution of safety efforts. One session was devoted to discussion of the framework for a performance-based regulatory approach. In addition, panelists and attendees discussed scope, schedules and status of specific regulatory items: containment leakage testing requirements, fire protection requirements, requirements for environmental qualification of electrical equipment, requests for information under 10CFR50.54(f), requirements for combustible gas control systems, and quality assurance requirements.

791 (NUREG/CP–0132) **Transactions of the Twenty-First Water Reactor Safety Information Meeting.** Monteleone, S. (comp.). Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research. Oct 1993. 179p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CONF-931079–: Water reactor safety information meeting, Bethesda, MD (United States), 25-27 Oct 1993). Source: OSTI; NTIS; INIS; GPO.

This report contains summaries of papers on reactor safety research to be presented at the 21st Water Reactor Safety Information Meeting at the Bethesda Marriott Hotel, Bethesda, Maryland, October 25–27, 1993. The summaries briefly describe the programs and results of nuclear safety research sponsored by the Office of Nuclear Regulatory Research, US NRC. Summaries of invited papers concerning nuclear safety issues from US government laboratories, the electric utilities, the Electric Power Research Institute (EPRI), the nuclear industry, and from foreign governments and industry are also included. The summaries have been compiled in one report to provide a basis for meaningful discussion and information exchange during the course of the meeting and are given in the order of their presentation in each session.

792 (NUREG/CR–4214-Rev.2-Pt.1) **Health effects models for nuclear power plant accident consequence analysis: Part 1, Introduction, integration, and summary: Revision 2.** Evans, J.S. (Harvard School of Public Health, Boston, MA (United States)); Abrahmson, S.; Bender, M.A.; Boecker, B.B.; Scott, B.R.; Gilbert, E.S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Inhalation Toxicology Research Inst., Albuquerque, NM (United States). Oct 1993. 147p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (ITRI–141). Source: OSTI; NTIS; INIS; GPO.

This report is a revision of NUREG/CR-4214, Rev. 1, Part 1 (1990), Health Effects Models for Nuclear Power Plant Accident Consequence Analysis. This revision has been made to incorporate changes to the Health Effects Models recommended in two addenda to the NUREG/CR-4214, Rev. 1, Part 11, 1989 report. The first of these addenda provided recommended changes to the health effects models for low-LET radiations based on recent reports from UNSCEAR, ICRP and NAS/NRC (BEIR V). The second addendum presented changes needed to incorporate alpha-emitting radionuclides into the accident exposure source term. As in the earlier version of this report, models are provided for early and continuing effects, cancers and thyroid nodules, and genetic effects. Weibull dose-response functions are recommended for evaluating the risks of early and continuing health effects. Three potentially lethal early effects – the hematopoietic, pulmonary, and gastrointestinal syndromes are considered. Linear and linear-quadratic models are recommended for estimating the risks of seven types of cancer in adults - leukemia, bone, lung, breast, gastrointestinal, thyroid, and "other". For most cancers, both incidence and mortality are addressed. Five classes of genetic diseases – dominant, x-linked, aneuploidy, unbalanced translocations, and multifactorial diseases are also considered. Data are provided that should enable analysts to consider the timing and severity of each type of health risk.

793 (NUREG/CR–4469-Vol.15) **Nondestructive Examination (NDE) Reliability for Inservice Inspection of Light Water Reactors: Volume 15, Semiannual report: October 1991–March 1992.** Doctor, S.R. (Pacific Northwest Lab., Richland, WA (United States)); Diaz, A.A.; Friley, J.R. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 34p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–5711-Vol.15). Source: OSTI; NTIS; INIS; GPO.

The Evaluation and Improvement of NDE Reliability for Inservice Inspection of Light Water Reactors (NDE Reliability) Program at the Pacific Northwest Laboratory was established by the Nuclear

Regulatory Commission to determine the reliability of current inservice inspection (ISI) techniques and to develop recommendations that will ensure a suitably high inspection reliability. The objectives of this program include determining the reliability of ISI performed on the primary systems of commercial light-water reactors (LWRs); using probabilistic fracture mechanics analysis to determine the impact of NDE unreliability on system safety; and evaluating reliability improvements that can be achieved with improved and advanced technology. A final objective is to formulate recommended revisions to ASME Code and Regulatory requirements, based on material properties, service conditions, and NDE uncertainties. The program scope is limited to ISI of the primary systems including the piping, vessel, and other components inspected in accordance with Section XI of the ASME Code. This is a progress report covering the programmatic work from October 1991 through March 1992.

794 (NUREG/CR–5829) **Auxiliary feedwater system risk-based inspection guidance for the Davis-Besse nuclear power plant.** Nickolaus, J.R. (Pacific Northwest Lab., Richland, WA (United States)); Moffitt, N.E.; Gore, B.F.; Vo, T.V.; Hopkins, J.B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Safety and Analysis; Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 35p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–7905). Source: OSTI; NTIS; INIS; GPO.

In a study sponsored by the US Nuclear Regulatory Commission (NRC), Pacific Northwest Laboratory has developed and applied a methodology for deriving plant-specific risk-based inspection guidance for the auxiliary feedwater (AFW) system at pressurized water reactors that have not undergone probabilistic risk assessment (PRA). This methodology uses existing PRA results and plant operating experience information. Existing PRA-based inspection guidance information recently developed for the NRC for various plants was used to identify generic component failure modes. This information was then combined with plant-specific and industry-wide component information and failure data to identify failure modes and failure mechanisms for the AFW system at the selected plants. Davis-Besse was selected as one of a series of plants for study. The product of this effort is a prioritized listing of AFW failures which have occurred at the plant and at other PWRs. This listing is intended for use by NRC inspectors in the preparation of inspection plans addressing AFW risk-important components at the Davis-Besse plant.

795 (NUREG/CR–5978) **Source term attenuation by water in the Mark I boiling water reactor drywell.** Powers, D.A. (Sandia National Labs., Albuquerque, NM (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 200p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-76DP00789. (SAND–92-2688). Source: OSTI; NTIS; INIS; GPO.

Mechanistic models of aerosol decontamination by an overlying water pool during core debris/concrete interactions and spray removal of aerosols from a Mark I drywell atmosphere are developed. Eighteen uncertain features of the pool decontamination model and 19 uncertain features of the model for the rate coefficient of spray removal of aerosols are identified. Ranges for values of parameters that characterize these uncertain features of the models are established. Probability density functions for values within these ranges are assigned according to a set of rules. A Monte Carlo uncertainty analysis of the decontamination factor produced by water pools 30 and 50 cm deep and subcooled 0–70 K is performed. An uncertainty analysis for the rate constant of spray removal of aerosols is done for water fluxes of 0.25, 0.01, and 0.001 cm^3 H_2O/cm^2-s and decontamination factors of 1.1, 2, 3.3, 10, 100, and 1000.

796 (NUREG/CR–6022) **High Pressure Coolant Injection (HPCI) System Risk-Based Inspection Guide for Browns Ferry Nuclear Power Station.** Wong, S. (Brookhaven National Lab., Upton, NY (United States)); DiBiasio, A.; Gunther, W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Safety and Analysis; Brookhaven National Lab., Upton, NY (United States). Sep 1993. 64p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52370). Source: OSTI; NTIS; INIS; GPO.

The High Pressure Coolant Injection (HPCI) system has been examined from a risk perspective. A System Risk-Based Inspection Guide (S-RIG) has been developed as an aid to HPCI system inspections at the Browns Ferry Nuclear Power Plant, Units 1, 2 and 3. The role of. the HPCI system in mitigating accidents is discussed in this S-RIG, along with insights on identified risk-based failure modes which could prevent proper operation of the system. The S-RIG provides a review of industry-wide operating experience, including plant-specific illustrative examples to augment the PRA and operational considerations in identifying a catalogue of basic PRA failure modes for the HPCI system. It is designed to be used as a reference for routine inspections, self-initiated safety system functional inspections (SSFIs), and the evaluation of risk significance of component failures at the nuclear power plant.

797 (ORNL/TM–12220) **Fuel-Coolant-Interaction modeling and analysis work for the High Flux Isotope Reactor Safety Analysis Report.** Taleyarkhan, R.P.; Georgevich, V.; Nestor, C.W.; Chang, S.J.; Freels, J.; Gat, U.; Lepard, B.L.; Gwaltney, R.C.; Luttrell, C.; Kirkpatrick, J. Oak Ridge National Lab., TN (United States). Jul 1993. 299p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001940. Source: OSTI; NTIS; INIS; GPO Dep.

A brief historical background and a description of short- and long-term task plan development for effective closure of this important safety issue for the HFIR are given. Short-term aspects deal with Fuel-Coolant-Interaction (FCI) issues experimentation, modeling, and analysis for the flow-blockage-induced steam explosion events in direct support of the SAR. Long-term aspects deal with addressing FCI issues resulting from other accidents in conjunction with issues dealing with aluminum ignition, which can result in an order of magnitude increase in overall energetics. Problem formulation, modeling, and computer code simulation for the various phases of steam explosions are described. The evaluation of core melt initiation propagation, and melt superheat are described. Core melt initiation and propagation have been studied using simple conservative models as well as from modeling and analysis using RELAP5. Core debris coolability, heatup, and melting/freezing aspects have been studied by use of the two-dimensional melting/freezing analysis code 2DKO, which was also benchmarked with MELCOR code predictions. Descriptions are provided for the HM, BH, FCIMOD, and CTH computer codes that have been implemented for studying steam explosion energetics from the standpoint of evaluating bounding loads by thermodynamic models or best-estimate loads from one- and two-dimensional simulations of steam explosion energetics. Vessel failure modeling and analysis was conducted using the principles of probabilistic fracture mechanics in conjunction with ADINA code calculations. Top head bolts failure modeling has also been conducted where the failure criterion was based upon stresses in the bolts exceeding the material yield stress for a given time duration. Missile transport modeling and analysis was conducted by setting up a one-dimensional mathematical model that accounts for viscous dissipation, virtual mass effects, and material inertia.

798 (ORNL/TM–12382) **Modeling and analysis of core debris recriticality during hypothetical severe accidents in the Advanced Neutron Source Reactor.** Taleyarkhan, R.P.; Kim, S.H.; Slater, C.O.; Moses, D.L.; Simpson, D.B.; Georgevich, V. Oak Ridge National Lab., TN (United States). May 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001939. Source: OSTI; NTIS; GPO Dep.

This paper discusses salient aspects of severe-accident-related recriticality modeling and analysis in the Advanced Neutron Source (ANS) reactor. The development of an analytical capability using the KENO V.A-SCALE system is described including evaluation of suitable nuclear cross-section sets to account for the effects of system geometry, mixture temperature, material dispersion and other thermal-hydraulic conditions. Benchmarking and validation efforts conducted with KENO V.A-SCALE and other neutronic codes against critical experiment data are described. Potential deviations

and biases resulting from use of the 16-group Hansen-Roach library are shown. A comprehensive test matrix of calculations to evaluate the threat of a recriticality event in the ANS is described. Strong dependencies on geometry, material constituents, and thermal-hydraulic conditions are described. The introduction of designed mitigative features is described.

799 (PNL–5547) **Full-length high-temperature severe fuel damage test No. 2: Final safety analysis.** Hesson, G.M.; Lombardo, N.J.; Pilger, J.P.; Rausch, W.N.; King, L.L.; Hurley, D.E.; Parchen, L.J.; Panisko, F.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001005. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous conditions associated with performing the Full-Length High- Temperature (FLHT). Severe Fuel Damage Test No. 2 experiment have been analyzed. Major hazards that could cause harm or damage are (1) radioactive fission products, (2) radiation fields, (3) reactivity changes, (4) hydrogen generation, (5) materials at high temperature, (6) steam explosion, and (7) steam pressure pulse. As a result of this analysis, it is concluded that with proper precautions the FLHT- 2 test can be safely conducted.

800 (PNL–5691) **Full-length high-temperature severe fuel damage test No. 1.** Rausch, W.N.; Hesson, G.M.; Pilger, J.P.; King, L.L.; Goodman, R.L.; Panisko, F.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 83p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000560. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the first full-length high-temperature test (FLHT-1) performed by Pacific Northwest Laboratory (PNL) in the National Research Universal (NRU) reactor at Chalk River, Ontario, Canada. The test is part of a series of experiments being performed for the NRC as a part of their Severe Fuel Damage Program and is one of several planned for PNL's Coolant Boilaway and Damage Progression Program. The report summarizes the test design and test plan. it also provides a summary and discussion of the data collected during the test and of the photos taken during the post-test examination. All objectives for the test were met. The key objective was to demonstrate that severe fuel damage tests on full-length fuel bundles can be safely conducted in the NRU reactor.

801 (PNL–6540) **Full-length high-temperature severe fuel damage test No. 5.** Lanning, D.D. (Pacific Northwest Lab., Richland, WA (United States)); Lombardo, N.J.; Hensley, W.K.; Fitzsimmons, D.E.; Panisko, F.E.; Hartwell, J.K. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001002. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes and presents data from a severe fuel damage test that was conducted in the National Research Universal (NRU) reactor at Chalk River Nuclear Laboratories (CRNL), Ontario, Canada. The test, designated FLHT-5, was the fourth in a series of full-length high-temperature (FLHT) tests on light-water reactor fuel. The tests were designed and performed by staff from the US Department of Energy's Pacific Northwest Laboratory (PNL), operated by Battelle Memorial Institute. The test operation and test results are described in this report. The fuel bundle in the FLHT-5 experiment included 10 unirradiated full-length pressurized-water reactor (PWR) rods, 1 irradiated PWR rod and 1 dummy gamma thermometer. The fuel rods were subjected to a very low coolant flow while operating at low fission power. This caused coolant boilaway, rod dryout and overheating to temperatures above 2600 K, severe fuel rod damage, hydrogen generation, and fission product release. The test assembly and its effluent path were extensively instrumented to record temperatures, pressures, flow rates, hydrogen evolution, and fission product release during the boilaway/heatup transient. Post-test gamma scanning of the upper plenum indicated significant iodine and cesium release and deposition. Both stack gas activity and on-line gamma spectrometer data indicated significant (~50%) release of noble fission gases. Post-test visual examination of one side of the fuel bundle revealed no massive relocation and flow blockage; however, run-down of molten cladding was evident.

802 (PNL–8829) **Large-break LOCA, in-reactor fuel bundle Materials Test MT-6A.** Wilson, C.L.; Hesson, G.M.; Pilger, J.P.; King, L.L.; Panisko, F.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 104p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000499. Source: OSTI; NTIS; INIS; GPO Dep.

This is a report on one of a series of experiments to simulates a loss-of-coolant accident (LOCA) using full-length fuel rods for pressurized water reactors (PWR). The experiments were conducted by Pacific Northwest Laboratory (PNL) under the LOCA simulation Program sponsored by the US Nuclear Regulatory Commission (NRC). The major objective of this program was causing the maximum possible expansion of the cladding on the fuel rods from a short-term adiabatic temperature transient to 1200 K (1700 F) leading to the rupture of the cladding; and second, by reflooding the fuel rods to determine the rate at which the fuel bundle is cooled.

803 (SAND–92-2165) **MELCOR 1.8.1 assessment: PNL Ice Condenser Aerosol Experiments.** Gross, R.J. Sandia National Labs., Albuquerque, NM (United States). Jun 1993. 175p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000344. Source: OSTI; NTIS; INIS; GPO Dep.

The MELCOR code was used to simulate PNL's Ice Condenser Experiments 11-6 and 16-11. In these experiments, ZnS was injected into a mixing chamber, and the combined steam/air/aerosol mixture flowed into an ice condenser which was l4.7m tall. Experiment 11-6 was a low flow test; Experiment l6-1l was a high flow test. Temperatures in the ice condenser region and particle retention were measured in these tests. MELCOR predictions compared very well to the experimental data. The MELCOR calculations were also compared to CONTAIN code calculations for the same tests. A number of sensitivity studies were performed. It as found that simulation time step, aerosol parameters such as the number of MAEROS components and sections used and the particle density, and ice condenser parameters such as the energy capacity of the ice, ice heat transfer coefficient multiplier, and ice heat structure characteristic length all could affect the results. Thermal/hydraulic parameters such as control volume equilibrium assumptions, flow loss coefficients, and the bubble rise model were found to affect the results less significantly. MELCOR results were not machine dependent for this problem.

804 (UCRL-ID–115111) **Eastern US seismic hazard characterization update.** Savy, J.B.; Boissonnade, A.C.; Mensing, R.W.; Short, C.M. Lawrence Livermore National Lab., CA (United States). Jun 1993. 392p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000553. Source: OSTI; NTIS; INIS; GPO Dep.

In January 1989, LLNL published the results of a multi-year project, funded by NRC, on estimating seismic hazard at nuclear plant sites east of the Rockies. The goal of this study was twofold: to develop a good central estimate (median) of the seismic hazard and to characterize the uncertainty in the estimates of this hazard. In 1989, LLNL was asked by DOE to develop site specific estimates of the seismic hazard at the Savannah River Site (SRS) in South Carolina as part of the New Production Reactor (NPR) project. For the purpose of the NPR, a complete review of the methodology and of the data acquisition process was performed. Work done under the NPR project has shown that first order improvement in the estimates of the uncertainty (i.e., lower mean hazard values) could be easily achieved by updating the modeling of the seismicity and ground motion attenuation uncertainty. To this effect, NRC sponsored LLNL to perform a reelicitation to update the seismicity and ground motion experts' inputs and to revise methods to combine seismicity and ground motion inputs in the seismic hazard analysis for nuclear power plant sites east of the Rocky Mountains. The objective of the recent study was to include the first order improvements that reflect the latest knowledge in seismicity and ground motion modeling and produce an update of all the hazard results produced in the 1989 study. In particular, it had been demonstrated that eliciting seismicity information in terms of rates of earthquakes rather than a- and b-values, and changing

the elicitation format to a one-on-one interview, improved our ability to express the uncertainty of earthquake rates of occurrence at large magnitudes. Thus, NRC sponsored this update study to refine the model of uncertainty, and to re-elicitate of the experts' interpretations of the zonation and seismicity, as well as to reelicitate the ground motion models, based on current state of knowledge.

805 (UCRL-JC–114680-VGS) **Estimated inventory of radionuclides in former Soviet Union naval reactors dumped in the Kara Sea.** Mount, M.E. (Lawrence Livermore National Lab., CA (United States)); Sheaffer, M.K.; Abbott, D.T. Lawrence Livermore National Lab., CA (United States). Jul 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930843–1: International conference on environmental radioactivity in the arctic and antarctic, Kirkenes (Norway), 23-27 Aug 1993). Order Number DE94001537. Source: OSTI; NTIS; INIS; GPO Dep.

Radionuclide inventories have been estimated for the reactor cores, reactor components, and primary system corrosion products in the former Soviet Union naval reactors dumped at the Abrosimov Inlet, Tsivolka Inlet, Stepovoy Inlet, Techeniye Inlet, and Novaya Zemlya Depression sites in the Kara Sea between 1965 and 1988. For the time of disposal, the inventories are estimated at 69 to 111 kCi of actinides plus daughters and 3,053 to 7,472 kCi of fission products in the reactor cores, 917 to 1,127 kCi of activation products in the reactor components, and 1.4 to 1.6 kCi of activation products in the primary system corrosion products. At the present time, the inventories are estimated to have decreased to 23 to 38 kCi of actinides plus daughters and 674 to 708 kCi of fission products in the reactor cores, 124 to 126 kCi of activation products in the reactor components, and 0.16 to 0.17 kCi of activation products in the primary system corrosion products. Twenty years from now, the inventories are projected to be 11 to 18 kCi of actinides plus daughters and 415 to 437 kCi of fission products in the reactor cores, 63.5 to 64 kCi of activation products in the reactor components, and 0.014 to 0.015 kCi of activation products in the primary system corrosion products. All actinide activities are estimated to be within a factor of two.

806 (WSRC-MS–93-469) **Seismic probabilistic risk assessment for K Reactor at the DOE Savannah River Site.** Wingo, H.E. (Westinghouse Savannah River Co., Aiken, SC (United States)); McCann, M.W. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9310102–20: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93041133. Source: OSTI; NTIS; INIS; GPO Dep.

The evaluation of the risk of core melt for the K Reactor indicated an improvement in the strength of the plant as the result of analyses and structural upgrades done for the reactor to satisfy requirements of the NRC USI A-46 unresolved safety issue. The evaluation for operator errors used the THERP methodology and applied this method to conditions required as the result of earthquakes. The evaluation indicated the strength of structures and equipment was stronger after the walk down and analyses were completed than before, although physical changes to the system were minimal. The net result of the re-analysis indicated the overall yearly risk of core melt frequency from earthquakes decreased from 1.2×10^{-4} per year to 7.5×10^{-5}. The uncertainty analysis indicated the 95 percentile value was 1.2×10^{-4}, and the five percentile value was 5.5×10^{-5}. The seismic hazard for the site used an evaluation of the Lawrence Livermore (LLNL) and the Electric Power Research Institute (EPRI) Hazard analysis for the plant site, with generic soils factors from the EPRI study. This hazard was determined from the two studies by comparing the predicted hazards with the historical record, and deleting those predictions that did not come close to the historical record.

807 (WSRC-TR–92-100-10) **Savannah River Technology Center monthly report.** Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1992. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94002031. Source: OSTI; NTIS; GPO Dep.

This document contains many small reports from personnel at the technology center under the umbrella topics of reactors, tritium, separations, environment, waste management, and general engineering. Progress and accomplishments are given.

24 POWER TRANSMISSION AND DISTRIBUTION

808 (UCRL-ID–115267) **Laser power beaming for satellite applications.** Friedman, H.W. Lawrence Livermore National Lab., CA (United States). 22 Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001547. Source: OSTI; NTIS; GPO Dep.

A serious consideration of laser power beaming for satellite applications appears to have grown out of a NASA mission analysis for transmitting power to lunar bases during the two week dark period. System analyses showed that laser power beaming to the moon in conjunction with efficient, large area solar cell collection panels, were an attractive alternative to other schemes such as battery storage and nuclear generators, largely because of the high space transportation costs. The primary difficulty with this scheme is the need for very high average power visible lasers. One system study indicated that lasers in excess of 10 MW at a wavelength of approximately 850 nm were required. Although such lasers systems have received much attention for military applications, their realization is still a long term goal.

2401 Power Systems

Refer also to citation(s) 2804

2403 Power Transmission Lines and Cables

809 (NISTIR–5268) **Research for electric energy systems – an annual report.** Anderson, W.E. (ed.). National Inst. of Standards and Technology (EEEL), Gaithersburg, MD (United States). Electricity Div. Oct 1993. 38p. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD (United States). Order Number DE94001839. Source: OSTI; NTIS; GPO Dep.

This report documents the technical progress in the two investigations which make up the project "Support of Research Projects for Electrical Energy Systems," Department of Energy Task Order Number 137, funded by the US Department of Energy and performed by the Electricity Division of the National Institute of Standards and Technology (NIST). The first investigation is concerned with the measurement of magnetic fields in support of epidemiogical and in vitro studies of biological field effects. During 1992, the derivation of equations which predict differences between the average magnetic flux density using circular coil probes and the flux density at the center of the probe, assuming a dipole magnetic field, were completed. The information gained using these equations allows the determination of measurement uncertainty due to probe size when magnetic fields from many electrical appliances are characterized. Consultations with various state and federal organizations and the development of standards related to electric and magnetic field measurements continued. The second investigation is concerned with two different activities related to compressed-gas insulated high voltage systems: (1) the measurement of dissociative electron attachment cross sections and negative ion production in S_2F_{10}, S_2OF_{10}, and $S_2O_2F_{10}$, and (2) Monte-Carlo simulations of ac-generated partial-discharge pulses that can occur in SF_6-insulated power systems and can be sources of gas decomposition.

2405 Environmental Aspects

Refer also to citation(s) 549, 552

810 (DOE/EIS–0145) **Non-Federal participation in AC Intertie: Draft Environmental Impact Statement.** USDOE Bonneville Power Administration, Portland, OR (United States). Aug 1993. 89p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2105). Order Number DE94001268. Source: OSTI; NTIS; GPO Dep.

BPA is considering action in two areas: (1) non-Federal access to the AC Intertie, and, (2) BPA intertie marketing. BPA's preferred alternative for non-Federal access is the Capacity Ownership alternative and for BPA Intertie marketing is the Federal Marketing and Joint Ventures alternative. BPA considered these two areas previously in its Intertie Development and Use EIS of April 1988. The EIS resulted in BPA decisions to participate in the construction of the Third AC Intertie, to allow non-Federal access to BPA's share of the (PNW)-(PSW) Intertie (AC and DC lines) pursuant to a Long-Term Intertie Access Policy (LTIAP), and to pursue BPA's export marketing alternative. In the No Action alternative, non-Federal access is allowed only pursuant to the LTIAP and no new long-term BPA or joint venture contracts with California parties are assumed. Different means of providing non-Federal access are contained in the following alternatives: Capacity Ownership (preferred non-Federal access), Capacity Ownership with Limited PSW Access (a scenario in which PSW parties in the Third AC have limited access arrangements in California), Increased Assured Delivery (non-Federal access to additional MWs but controlled by provisions of the LTIAP), Increased Assured Delivery with Intertie Access for Non-Scheduling Utilities (direct LTIAP access is expanded to entities which now must gain access through arrangements with BPA or other PNW scheduling utilities) and Economic Priority (Intertie access determined based on net economic benefit of proposed transactions). The No action alternative with respect to BPA Intertie marketing includes existing BPA contracts with PSW parties and existing joint ventures. The Federal Marketing and Joint Venture alternative (preferred BPA Intertie marketing alternative) contains a BPA marketing proposal designed to increase the value of hydro flows provided for fish.

811 (NEI-SE–136) **An analytical theory of transmission line shielding.** Pettersson, Per (Swedish State Power Board, Vaellingby (Sweden)). Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electrical Plant Engineering. [1993]. 7p. Order Number DE94709807. Source: OSTI; NTIS; INIS.

Paper in the dissertation of Per Pettersson.

The classical electrogeometric model of shielding failure flashovers on transmission lines is investigated by analytical methods. Most of the basic elements that has appeared in the literature on the subject have been incorporated and put into a comprehensive model. These elements are: tower top geometry, structure height above ground, line insulation, lateral slope of ground, probability distribution of lightning currents, ratio of striking distances to ground wire and earth relative to conductor, and probability distribution of lightning leader approach angle to ground. Departing from a basic idealistic case, the sensitivity of the model to variations in these parameters is studied. Numerical examples are given. 8 refs, 8 figs, 1 tab.

812 (TRITA-EEA–9302) **Analytical methods for study of transmission line lightning protection.** Pettersson, Per. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electrical Plant Engineering. Apr 1993. 16p. Order Number DE94709806. Source: OSTI; NTIS; INIS.

Transmission line lightning performance is studied by analytical methods. The elements of shielding failure flashovers and back-flashovers are analysed as functions of incidence, response and insulation. Closed-form approximate expressions are sought to enhance understanding of the phenomena. Probabilistic and wave propagation aspects are particularly studied. The electrogeometric model of lightning attraction to structures is used in combination with the log-normal probability distribution of lightning to ground currents. The log-normality is found to be retained for the currents collected by mast-type as well as line-type structures, but with a change of scale. For both types, exceedingly simple formulas for the number of hits are derived. Simple closed-form expressions for the line outage rates from back- flashovers and shielding failure flashovers are derived in a uniform way as functions of the critical currents. The expressions involve the standardized normal distribution function. System response is analysed by use of Laplace transforms in combination with text-book transmission-line theory. Inversion into time domain is accomplished by an approximate asymptotic method producing closed-form results. The back-flashover problem is analysed in particular. Approximate, image type expressions are derived for shunt admittance of wires above, on and under ground for analyses of fast transients. The derivation parallels that for series impedance, now well-known. 3 refs, 5 figs.

2407 Economic, Industrial, and Business Aspects

Refer also to citation(s) 549

25 ENERGY STORAGE

Refer also to citation(s) 578

2502 Compressed and Liquefied Gas

Refer also to citation(s) 927

2509 Batteries

813 (ETDE-IT–93-198) **Early prediction of electrolytic cells fault conditions using knowledge based simulation.** Balducelli, C. (ENEA, Casaccia (Italy). Area Energetica); Vicoli, G. 1993. 5p. (CONF-9206165–2: European simulation multiconference, York (United Kingdom), 1-4 Jun 1992). Order Number DE93522936. Source: OSTI; NTIS (US Sales Only).

This paper describes the application of a computerized operator support system in primary aluminium production plants in order to prevent electrolytic cell fault conditions. This system was developed by ENEA (Italian Agency for Energy, New Technologies and the Environment) with the consultation of Portovesme ALUMINIA plant operators. The system implementation was done using ART (Automated Reasoning Tool) by Inference Corporation on the Lisp Machine TEXAS EXPLORER II. The Run-Time version is installed on a Vax-Station machine. This paper, after a brief introduction, describes the integration of the expert system in the productive process, the knowledge base architecture and the implemented module functionalities.

814 (SAND–93-0160C) **Dynamic thermal testing of lead-acid batteries for the PREPA battery energy storage system.** Jungst, R.G.; Freese, J.M.; Rodriguez, G.P.; Dykhuizen, R.C.; Braithwaite, J.W.; Woods, C. Sandia National Labs., Albuquerque, NM (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309217–1: 4. international conference on batteries for energy storage, Berlin (Germany), 29 Sep - 1 oct 1993). Order Number DE93018841. Source: OSTI; NTIS; GPO Dep.

A test is being carried out to determine the thermal load that will be present in a 20 MW battery energy storage system (BESS) facility being built by the Puerto Rico Electric Power Authority (PREPA). Efforts were made to duplicate, on a smaller scale, the arrangement of the flooded lead-acid cells in the BESS and to generate ambient temperatures typical of Puerto Rico through use of an environmental chamber. A utility energy storage (UES) test cycle for the 12-cell series string was set up based on projected operating parameters scaled from the BESS for frequency regulation and spinning reserve operating modes. Battery temperatures were measured during UES cycling and fit to a thermal model for the system. Cell temperatures increased slowly over a week-long utility cycle and eventually were elevated by 13°C (23°F) in the most extreme case observed to date. Temperature increases are expected to be lower in the BESS facility due to a much higher air flow rate than in the test chamber.

815 (SAND–93-0188) **Evaluating the ignition sensitivity of thermal battery heat pellets.** Thomas, E.V. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000350. Source: OSTI; NTIS; GPO Dep.

Thermal batteries are activated by the ignition of heat pellets. If the heat pellets are not sensitive enough to the ignition stimulus, the thermal battery will not activate, resulting in a dud. Thus, to assure reliable thermal batteries, it is important to demonstrate that

the pellets have satisfactory ignition sensitivity by testing a number of specimens. There are a number of statistical methods for evaluating the sensitivity of a device to some stimulus. Generally, these methods are applicable to the situation in which a single test is destructive to the specimen being tested, independent of the outcome of the test. In the case of thermal battery heat pellets, however, tests that result in a nonresponse do not totally degrade the specimen. This peculiarity provides opportunities to efficiently evaluate the ignition sensitivity of heat pellets. In this paper, a simple strategy for evaluating heat pellet ignition sensitivity (including experimental design and data analysis) is described. The relatively good asymptotic and small-sample efficiencies of this strategy are demonstrated.

816 (SAND–93-1770C) **Development of the sodium/sulfur battery technology for utility applications.** Braithwaite, J.W. (Sandia National Labs., Albuquerque, NM (United States)); Koenig, A.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309217–3: 4. international conference on batteries for energy storage, Berlin (Germany), 29 Sep - 1 oct 1993). Order Number DE93018838. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy is sponsoring the development of battery energy storage systems for electric utilities. An important part of this DOE program is the engineering of the battery subsystem. Because lower costs are possible and less space is required compared with conventional battery technologies, two advanced battery systems are being developed: sodium/sulfur and zinc/bromine. A brief description of the development approach being followed along with the current status of the sodium/sulfur technology is described in this paper. Of immediate relevance, a factory integrated modular sodium/sulfur system has been designed that incorporates many of the advantages of this technology. Each module (designated as NAS-P_{AC}) combines a 600-kWh sodium/sulfur battery, a 300 kW power converter and a control system. In addition to the potential for low life-cycle cost, other specific benefits include excellent portability and an installed system-level footprint that is about 20% of an equivalent system using lead-acid batteries. The sodium/sulfur battery is designed to deliver its rated energy for 1500 cycles or 5 years of maintenance-free operation.

817 (SAND–93-1817C) **Overview of the US Department of Energy Utility Battery Storage Systems Program.** Eaton, R. (USDOE, Washington, DC (United States)); Akhil, A.; Butler, P.C.; Hurwitch, J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309217–2: 4. international conference on batteries for energy storage, Berlin (Germany), 29 Sep - 1 oct 1993). Order Number DE93018840. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE) is sponsoring the Utility Battery Storage Systems Program at Sandia National Laboratories and its contractors. This program is specifically aimed at developing battery energy storage systems for electric utility applications commencing in the mid to late 1990s. One factory-integrated utility battery system and three battery technologies: sodium/sulfur, zinc/bromine, and lead-acid are being developed under this program. In the last few years the emphasis of this program has focused on battery system development. This emphasis has included greater interactions with utilities to define application requirements. Recent activities have identified specific applications of battery energy storage in certain utility systems and quantified the value of these applications to these utility companies. In part due to these activities, battery energy storage is no longer regarded by utilities as a load-leveling resource only, but as a multifunction, energy management resource.

818 (SAND–93-1849C) **The development of advanced lead-acid batteries for utility applications.** Szymborski, J. (GNB Industrial Battery Co., Lombard, IL (United States)); Jungst, R.G. Sandia National Labs., Albuquerque, NM (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309217–4: 4. international conference on batteries for energy storage, Berlin (Germany), 29 Sep - 1 oct 1993). Order Number DE94001209. Source: OSTI; NTIS; GPO Dep.

Technical advances in lead-acid battery design have created new opportunities for battery systems in telecommunications, computer backup power and vehicle propulsion power. Now the lead-acid battery has the opportunity to become a major element in the mix of technologies used by electric utilities for several power quality and energy and resource management functions within the network. Since their introduction into industrial applications, Valve Regulated Lead-Acid (VRLA) batteries have received widespread acceptance and use in critical telecommunications and computer installations, and have developed over 10 years of reliable operational history. As further enhancements in performance, reliability and manufacturing processes are made, these VRLA batteries are expanding the role of battery-based energy storage systems within utility companies portfolios. This paper discusses the rationale and process of designing, optimizing and testing VRLA batteries for specific utility application requirements.

819 (UCRL-JC–114996) **Cycle life testing of lithium-ion batteries for small satellite LEO space missions.** Mayer, S.T.; Feikert, J.H.; Kaschmitter, J.L. Lawrence Livermore National Lab., CA (United States). 16 Aug 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309225–1: American Institute of Aeronautics and Astronautics conference on small satellites, Logan, UT (United States), 13-16 Sep 1993). Order Number DE93019620. Source: OSTI; NTIS; GPO Dep.

In 1990, Sony corporation announced their intention to manufacture a rechargeable lithium ion battery, based on the intercalation of lithium ions into a carbonaceous anode. The cells were first introduced for portable telephone use in June, 1991. (1) A 3.6V average cell voltage (4.1-2.75V range); (2) Excellent cycle life (1200 @ 100% DOD); (3) Good capacity retention (70% after 6 months); (4) Wide temperature range performance (−20 to +60°C); (5) Excellent Discharge rate (82% capacity at 30 min. discharge rate); (6) Excellent Charge rate (100% Charge in <3 hrs); and (7) High energy density (264 W*hr/1 and 120 Whr/kg for "D" size cell. These specifications show significant promise for application of these batteries in low earth orbit (LEO) small satellites, particularly when compared to existing NiH_2 and NiCd technology. The very high energy density and specific energy will reduce power system volume and weight. The wide temperature range enables simpler thermal design, particularly for new, small, high power satellites. The materials used in the lithium ion batteries are relatively inexpensive and benign, so that we expect costs to come down substantially in the future. The specified cycle life at 100% DOD is also 50% longer than most NiCds, so low DOD (depth of discharge) performance could be substantial. This study was undertaken to: (a) assess the feasibility for using lithium ion cells on small satellite LEO missions and (b) verify the claims of the manufacturer. This was accomplished by performing a detailed autopsy and various depth of discharge and rate tests on the cells. Of special interest was the cycle life performance of these cell at various depths of discharge DOD's, to get an initial measure of the reduction in capacity fade with cycle conditions. Low DOD's are used to extend the life of all batteries used in a space application.

2520 Health and Safety

820 (BFR-R–9-93) **Survey of incidence of Legionella in Swedish water supply systems.** Szewzyk, R. (Statens bakteriologiska laboratorium, Stockholm (Sweden)); Stenstroem, T.A. Swedish Council for Building Research, Stockholm (Sweden). 1993. 76p. (In Swedish). Project BFR-910781-2. Order Number DE94709815. Source: OSTI; NTIS.

The object of this project was to chart the incidence of Legionella in water supply systems and indoor installations in 13 selected Swedish municipalities and to relate this incidence to the type of raw water, water treatment, the chemical composition of water, the material in pipes and fittings, temperature, and the type and construction of water heaters. About 1,000 samples were taken and analysed. Legionella pneumophila was found in 15% of the samples. In cold water the frequency of positive tests was

lower (4%) than in hot water (25%), and the same applied to the Legionella counts. (author) tabs., figs., 132 refs.

29 ENERGY PLANNING AND POLICY

821 (DOE/BP/15474–T1) **Evaluation of Resource Acquisition Approaches: Final report.** O'Neill, M.L.; Mortimer, T.; Palermini, D.; Nelson, K. O'Neill and Co., Seattle, WA (United States). 12 Sep 1991. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AT79-91BP15474. Order Number DE93018974. Source: OSTI; NTIS; GPO Dep.

Over the last few years, Bonneville has been addressing this need and has developed numerous ways of acquiring resources. Four of these Approaches, the Competitive Acquisition, Billing Credits, and Targeted Acquisition Programs, and the Cowlitz Falls Hydroelectric Project, were the subject of this evaluation project. Each Approach is currently in different stages of a process, and Bonneville felt it was an appropriate time that an evaluation be conducted. The purpose of this evaluation is to analyze the various Approaches' processes, to learn what's working and what's not, and to offer recommendations as to how Bonneville might improve their resources acquisition efforts. The evaluation was conducted with no preconceived biases.

2901 Energy Analysis and Modeling

Refer also to citation(s) 831

2902 Economics and Sociology

Refer also to citation(s) 672, 861, 872, 949, 1100

822 (ANL/EAIS/CP–79749) **Economic efficiency, IRPs and long term contracts.** Sutherland, R.J. Argonne National Lab., Washington, DC (United States). 30 Apr 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9306239–1: Western Economics Association (WEA) meeting, Lake Tahoe, NV (United States), 20-24 Jun 1993). Order Number DE93018616. Source: OSTI; NTIS; GPO Dep.

There is no market failure that warrants utility regulation of the construction of new generating plants, the supply of energy efficiency or the purchase of fuel under contract. The natural monopoly problem applies to the distribution of electricity and gas, not to generation, energy conservation, or gas purchases. Utility regulation magnifies a market failure, which is the principal agent problem. Regulatory allowance of utilities signing long term fixed price contracts and undertaking conservation measures result in costs and risks being shifted to ratepayers that would not occur under competitive market conditions. Economic efficiency would be enhanced if cost of service regulation of electric and gas utilities were replaced by a competitive market process for the construction of new power plants, utility conservation programs and contracts to purchase fuel. Conservation measures could be supplied by energy service companies. Gas merchants could provide gas and energy conservation directly to ultimate customers, if they had access to LDC pipelines. With a competitive market established to sell gas and energy services, contracts and conservation measures would not require cost-of- service regulation.

823 (NEDO-P–9180) **Basic investigation on developing new energy technologies in Brazil.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 54p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714896. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A survey was made on energy situations in Brazil on the assumption that international cooperation will be given to the country. The nation's energy policy includes 18% reduction of energy consumption by 2010, alleviation of foreign oil dependence, expansion of electric power supply, expansion of natural gas ratio, and increase in coal supply. Hydraulic power generation capacity has been established largest in the south-eastern area, with the future emphasis to be placed on the Amazon area. A plan calls for hydraulic power generation to supply 88% of the power demand of 83,852MW in 2000. Ethanol production using sugar canes as the raw material has reached 11.5 billion liters at maximum, of which majority is used for automotive fuel, and the part for fuel in the chemical industry. However, the absolute supply quantity is insufficient under economic chaos. Natural gas production amounted to 6.3 billion m^3 in 1990. The government gives priority to a plan to gasify strained lees from sugar canes for use in power generation. Taking up environmental problems is still new, but the government lays stress on it. The government desires cooperations from foreign countries both in fund and technical aspects for energy conservation, energy efficiency improvement, personnel training, and renewable energy utilization. 15 refs., 5 figs., 41 tabs.

824 (NREL/TP–461-4857a) **Trends in public perceptions and preferences on energy and environmental policy: Executive summary.** Farhar, B.C. National Renewable Energy Lab., Golden, CO (United States). Mar 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93000095. Source: OSTI; NTIS; GPO Dep.

This is a summary of a report that presents selected results from a secondary analysis of public opinion surveys, taken at the national and state/local levels, relevant to energy and environmental policy choices. The data base used in the analysis includes about 2,000 items from nearly 600 separate surveys conducted between 1979 and 1992. Answers to word-for-word questions were traced over time, permitting trend analysis. Patterns of response were also identified for findings from similarly worded survey items. The analysis identifies changes in public opinion concerning energy during the past 10 to 15 years.

2903 Environment, Health, and Safety

Refer also to citation(s) 37, 93, 242, 469, 574, 824, 858, 865, 1888, 1910, 1947, 1948, 1969

825 (CONF-9310145–2) **Performance of the Carbon Dioxide Information Analysis Center (CDIAC).** Stoss, F.W. (Univ. of Tennessee, Knoxville, TN (United States). Environment, Energy, and Resources Center); Jones, S.B. Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From INFOTECH '93; Oak Ridge, TN (United States); 20-23 Oct 1993. Order Number DE94002190. Source: OSTI; NTIS; INIS; GPO Dep.

The Carbon Dioxide Information Analysis Center (CDIAC) provides information and data resources in support of the US Department of Energy's Global Change Research Program. CDIAC also serves as a resource of global change information for a broader international commonly of researchers, policymakers, managers, educators, and students. The number of requests for CDIAC's data products, information services, and publications has grown over the years and represents multidisciplinary interests in the physical, life, and social sciences and from diverse work settings in government, business, and academia. CDIAC's staff addresses thousands of requests yearly for data and information resources. In response to these requests, CDIAC has distributed tens of thousands of data products, technical reports, newsletters, and other information resources worldwide since 1982. This paper describes CDIAC, examines CDIAC's user community, and describes CDIAC's response to requests for information. The CDIAC Information System, which serves as a comprehensive PC-based inventory and information management tracking system, is also described.

826 (LA-UR–93-3008) **A combined GIS-HEC procedure for flood hazard evaluation.** McLin, S.G. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310102–13: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93040129. Source: OSTI; NTIS; GPO Dep.

A technique is described for incorporating a drainage recognition capability into a graphical information system (GIS) database. This capability is then utilized to export digital topographic profiles of

stream-channel cross-sectional geometries to the Hydrologic Engineering Center's Water Surface Profile (HEC-2) model. This model is typically used in conjunction with the Flood Hydrograph (HEC-1) package to define floodplain boundaries in complex watersheds. Once these floodplain boundaries are imported back into the GIS framework, they can be uniquely referenced to the New Mexico state plane coordinate system. A combined GIS-HEC application in ungaged watersheds at Los Alamos National Laboratory is demonstrated. This floodplain mapping procedure uses topographic data from the Laboratory's MOSS database. Targeted stream channel segments are initially specified in the MOSS system, and topographic profiles along stream-channel cross-sections am extracted automatically. This procedure is initiated at a convenient downstream location within each watershed, and proceeds upstream to a selected termination point. HEC-2 utilizes these MOSS channel data and HEC-1 generated storm hydrographs to uniquely define the floodplain. The computed water surface elevations at each channel section am then read back into the MOSS system. In this particular application, 13 separate elongated watersheds traverse Laboratory lands, with individual channels ranging up to 11 miles in length. The 50, 100, and 500-year floods, and the Probable Maximum Flood (PMF) are quantified in HEC-1. Individual floodplains are then defined for each channel segment in HEC-2 at 250 foot intervals, and detailed 1:4800 scale maps am generated. Over 100 channel miles were mapped using this combined GIS-HEC procedure.

827 (NEDO-C–9202, pp. 63-69) **Effects of environmental regulations on prospects for Korean coal demand.** Woo, L. (Korea Energy Economics Institute, Seoul (Korea, Republic of)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture given by a Korean representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). The lecture discusses prospects for coal demand and supply in Korea and effects of environmental regulations thereon. The total coal demand is estimated to increase at an annual rate of 5.4% until 2010. The international coal market is anticipated of stabilization now and hereafter, and the price is predicted to remain in an annual rise of 1% or lower. This view is the largest factor for Korean electric power companies to aim at increasing their total coal burning power generation capacity from 2680 MW in 1992 to 17160 MW in 2006. On the other hand, concerns about environmental pollution have been increasing as the economic level rises. This situation would result in establishing more rigorous environmental regulations including an obligation to install scrubbers in coal burning power plants, or introduction of CO2 tax. As a result, the competitive power of the coal power generation would be weakened against nuclear and LNG power generation, causing a possibility that the capacity expansion plan may have to be given a downward modification. 4 tabs.

828 (NEDO-GET–9201) **Investigation into the evaluation method for CO2 reduction technology in the chemical related industry field.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 207p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714881. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper proposes a concept of a new evaluation method using a technique similar to the interindustry relations analysis method as basic principle to quantitatively evaluate CO2 control effects of various CO2 reduction technologies adopted in production processes of the chemical related industry field. For evaluation of CO2 reduction technologies, a method with cumulative CO2 emission unit requirement as an evaluation index is proposed. At a paper and pulp production plant, the method is tried to evaluate and study reuse of the used paper recovered from a viewpoint of CO2 control effect. Presuming two types of production process which are a chemical process for acrylamide, ethanol and acetic acid and a biochemical process, trial estimation is made on the unit requirement of cumulative CO2 emissions from chemicals produced in each production process. Concerning the hydrogen production process, trial estimation is made on cumulative CO2 emission unit requirement for water electrolysis and thermochemical decomposition. As unsolved problems on the evaluation method, studies are made on recycling and reuse of the used products, and on evaluation principle for waste. 37 refs., 96 figs., 75 tabs.

829 (NEDO-GET–9202) **Investigation on energy conversion technology using biological reaction elements.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 294p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714882. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Studies are made on a system which can make effective energy supply to production of matters like hydrogen and a combined technology with chemical reaction, by the use of biochemical reaction elements. As for the study on improvement of photosynthetic ability using a gene engineering method, the paper proposes a molecular biological study on CO2 fixation by photosynthesis of solar energy, gene artificial alteration in relation to photosynthesis and breeding of terrestrial plant having high photosynthetic ability by gene introduction, elucidation of photosynthesis mechanism using green algae, drought resistance of the desert, breeding and photosynthesis mechanism of salt tolerance plant, etc. Concerning environment-harmony type energy conversion/storage system using microorganism, studies are made on the following: extraction of chemical energy substances from unused organic sources using hydrogen oxidative bacteria, direct conversion of light energy by photosynthesis, interconversion of electric energy and biological reaction, genetic methods of alternation of microorganism and enzyme concerned with various reactions, molecular biological study of iron oxidative bacteria, etc. 783 refs., 96 figs., 41 tabs.

830 (NEDO-GET–9204) **Investigation into the evaluation method for CO2 reduction technology in the fossil-fuel multi-consumption type industry field. 2.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 181p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714883. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

To establish a new method for quantitative evaluation of CO2 control effects of various CO2 reduction technologies in production processes in the fossil-fuel multi-consumption industry field, this paper proposes a concept of a new evaluation method with an idea similar to the interindustry relations analysis as a basic principle and studies a possibility of applying it to the real problems. To make a rational evaluation on CO2 control effect of CO2 reduction technology in the production process, the paper proposes a new evaluation method with cumulative CO2 emission unit requirement as an evaluation index. As a sheet glass manufacturing plant, an evaluation is conducted in terms of CO2 control effect, calculating cumulative CO2 emission unit requirement for products of the glass industry. At the electric power industry, a consideration is made based on cumulative CO2 emission unit requirement, presuming various kinds of scenario on future power demand and composition of power sources. The paper conducts a technical study of the present and future status of electric vehicles and secondary batteries therefor and makes an evaluation of CO2 reduction measures for electric vehicles. 27 refs., 63 figs., 77 tabs.

831 (NEDO-GET–9205) **Survey on evaluation of energy technology contributing to preservation of the global environment. 2.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 289p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714884. Source:

OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The analysis and evaluation are made on effectiveness of each of the energy technologies having large effects on control of greenhouse effect gas emissions. Details of the report based on the Framework Convention on Climate Change of the United Nations Conference on Environment and Development should essentially be made by efforts spontaneously exerted by countries now being in transitional economy and developing countries. The required database, however, has not necessarily been prepared. It is, therefore, necessary that developed countries should assist the countries in preparing methodology for estimating emission and absorption of greenhouse effect gases, and methodology or knowhow for working out domestic or regional plans. As for 'IPCC/EIS-IIASA International Workshop', discussions on the following are reported: energy-related greenhouse gases reduction and removal, analysis of factors affecting energy consumption and CO2 emissions and their regional and sectoral differences, and assessment of technologies for reducing CO2 emission. Also introduced is a report of the Eighth Session on the Intergovernmental Panel on Climate Change. 10 refs., 78 figs., 9 tabs.

832 (NEDO-GET–9209) **Survey on chemical engineering technologies for the global environmental protection.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 165p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714887. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The present paper suggests chief measures to suppress and reduce global greenhouse gases. Under the control of artificial environments such as bioreactor, hydroponics and vegetable factory, a very high fixing rate of CO2 can be obtained, but CO2 generation accompanying electric power consumption is also large. It is preferable to use methane as resource by reforming reactions or selective oxidative reaction. In the recovery technique of fluorocarbon, 100% recovery is desirable. Techniques for decomposing recovered fluorocarbon and converting it to harmless material are the most backward ones. Understanding of essential structural relationship of coal is necessary for establishing combustion technique for the reduction of N2O. The integrated power generation system composed from solid electrolyte type fuel cell and coal-gasifying process, high-performance, superheat pump system form scientific technology imposing no burden on the global environment. Establishment of purification technique for industrial- or living-related drain inflowing to a closed water area system, establishment and reinforcement of inspection system for oil spill in the oceans in a global scale are required. 240 refs., 63 figs., 30 tabs.

833 (NEDO-GET–9210-1) **Investigations on trends in global environment adaptive industrial technologies.: Investigations and studies on measures to reduce greenhouse gases chemically and their evaluation.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 121p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714888. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper describes specific evaluations on measures to reduce carbon dioxide chemically, and measures to reduce non-carbon dioxide greenhouse gases. The former measures could reduce CO2 by 10% to 20% by improving energy utilization and using unutilized energy recovering technologies. The key to fixing CO2 through hydrogenation is how to ensure the hydrogen availability. During the coming two decades, the Japanese chemical industry is expected to reduce CO2 of about ten million tons, or about 10%. Use of CO2 oxidizing dehydrogenation process would be capable of reducing CO2 of about five million tons in Japan. For the latter measures, chemical technologies are available to recover and store methane as the greenhouse gas other than CO2. Promotion is urged in combustion technologies to suppress N2O generation, and technologies to treat waste gases from automotive tertiary catalysts and adipic acid processes. Fluorocarbon reduction requires development of technologies to synthesize, recover and treat new substitute materials. Positive measures are also called for to reduce CO, non-methane based hydrocarbons, and NOx. 144 refs., 40 figs., 38 tabs.

834 (NEDO-GET–9210-5) **Investigation on construction of the database system for research and development of the global environment industry technology.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 177p. (In Japanese). Order Number DE94714890. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper studies a concrete plan to introduce a new database system of Research Institute of Innovative Technology for the Earth (RITE) which is necessary to promote the industrial technology development contributing to solution of the global environmental problem. Specifications for system introduction are about maker selection, operation system, detailed schedule for introduction, etc. RITE inhouse database has problems on its operation system and its maintenance cost, and is apt to be high in a construction cost in comparison with a utilization factor. Further study is made on its introduction. Information provided by the inhouse database is only the one owned by the organization, and information outside the organization is provided by the external database. The information is registered and selected by the registerer himself. The access network is set by personal computer network at the beginning and is set to transit to INTERNET in the future. For practical construction of the system, it is necessary to make user's detailed needs clear for the system design and to adjust functions between hardware systems. 32 figs., 9 tabs.

835 (NEDO-GET–9213) **Survey on utilization of database for research and development of global environmental industry technology.** Queen Mary Coll., London (United Kingdom). School of Mathematics. Mar 1993. 99p. (In Japanese). Order Number DE94714891. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

To optimize networks and database systems for promotion of the industry technology development contributing to the solution of the global environmental problem, studies are made on reusable information resource and its utilization methods. As reusable information resource, there are external database and network system for researchers' information exchange and for computer use. The external database includes commercial database and academic database. As commercial database, 6 agents and 13 service systems are selected. As academic database, there are NACSIS-IR and the database which is connected with INTERNET in the U.S. These are used in connection with the UNIX academic research network called INTERNET. For connection with INTERNET, a commercial UNIX network service called IIJ which starts service in April 1993 can be used. However, personal computer communication network is used for the time being. 6 figs., 4 tabs.

836 (NEDO-ITE–9110-6) **Survey on construction of a database system for global environment industrial technology research and development.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 136p. (In Japanese). Order Number DE94714880. Source: OSTI; NTIS; Available from New Energy and Industrial Technogy Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

As a database system of Research Institute of Innovative Technology for the Earth (RITE) which is necessary to promote industrial technology development contributing to the global environment problem, this paper studies a fundamental and concrete plan based on the RITE-NOW concept. This database system provides researchers with information which is not all-inclusive but selected and is categorized into specialized topics. Conditions for constructing the system are effective use of semi-open information environment and no trouble for operation. To realize the conditions, a concept of the information processing factory is introduced.

Information to be handled is the one predicting research and development in time sequence. Retrieval is a bulletin board type which makes list retrieval possible and a database type. For systematization in the fundamental construction plan, the following are databased information exchanged between researchers and developers on the electronic bulletin board, that is details of the global environment industrial technology symposium and the electronic conference, as well as introduction of the report papers from home and abroad. 52 figs., 11 tabs.

837 (NEI-SE–133) **Basis for cost-effective reduction of carbon dioxide emissions from traffic.** Hesselborn, P.O. (Swedish Road and Traffic Research Inst., Linkoeping (Sweden)). Swedish Transport Research Board, Stockholm (Sweden). 15 Sep 1992. 16p. (In Swedish). Order Number DE94709811. Source: OSTI; NTIS.

Appendix to TFB–92-29.

The most effective mean for reducing CO_2 emission is suggested to be a tax on automotive fuels. It is argued that the present CO_2 tax in Sweden (about 0.03 USD/kg CO_2) is too low, and needs to be about four times as high to have effect on the traffic emission. This report demonstrates how a correct level of the CO_2-tax can be calculated under different premises. 15 refs.

838 (NEI-SE–134) **To reduce carbon dioxide emissions. Basis for formulation of objectives.** Lind, G. (Transek AB, Solna (Sweden)). Swedish Transport Research Board, Stockholm (Sweden). Sep 1992. 58p. (In Swedish). Order Number DE94709812. Source: OSTI; NTIS.

Appendix to TFB–92-29.

In this report, a number of environmental issues in the transport sector are scrutinized. The calculations will be used in a broader study on behalf of the Swedish Department of Transportation aiming at identification and evaluation of the effects of potential measures to reduce the carbon dioxide emissions from the transport sector. Earlier studies are examined and the environmental effects are recalculated with new emission data. Studies used are e.g. the traffic studies that were initiated in connection with negotiations concerning infrastructure measures in the Stockholm region and the comprehensive assessment of the effects by implementation of Road Transport Informatics (RTI) in the Gothenburg region. The study shows that the knowledge of the environmental effects of different traffic have to be improved. The potential to reduce the carbon dioxide emissions is estimated to about 2 million tons yearly, which correspond to about 10% of the total Swedish emissions. 23 refs, 38 tabs.

839 (PNL–8799-Pt.1) **Orientation to occupational safety compliance in DOE: Student manual, Book 1: Part 1.** Pacific Northwest Lab., Richland, WA (United States). [1993]. 490p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001354. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to present Federal safety and health program requirements, provide an overview of DOE Safety and Health Programs, and to present information on the changes presently underway in the Department of Energy regarding safety and health. Public Law 91–596, Executive Order 12196,29 CFR 1960 and various related DOE Orders will be presented.

840 (PNL-SA–22959) **Designing public participation training for managers.** Bradbury, J.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308184–1: International Association of Public Participation Practitioners conference, Richland, WA (United States), 30 Aug - 3 sep 1993). Order Number DE94001666. Source: OSTI; NTIS; GPO Dep.

This paper discusses the needs assessment interviews that were conducted prior to the design and implementation of pilot training workshops in public participation for managers in the Headquarters offices and two sites of the Department of Energy (DOE) Environmental Restoration and Waste Management program. It is the first in a two-part overview of Battelle's experience in designing and implementing public participation training for managers. The presentation is divided into four sections in addition to this introduction. Sections 1 and 2 outline the purpose and method, respectively. The findings are summarized in Section 3. Section 4 concludes with a summary of the implications for training.

841 (PNL-SA–23021) **US Department of Energy phaseout of CFC-refrigerants.** Miller, K.B. (Pacific Northwest Lab., Washington, DC (United States)); Purcell, C.W.; Turner, M.H.; Conover, D.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9309137–1: International specialty conference on control of ozone depleting substances: delivering the Montreal protocol, Whistler (Canada), 22-24 Sep 1993). Order Number DE94001668. Source: OSTI; NTIS; GPO Dep.

DOE's goal is to phase out the use of ODSs by implementing environmentally safe alternative substances and processes within a timeframe that is consistent with the requirements and spirit of Executive Order 12843 and Title VI of the Clean Air Act. Refrigeration and air conditioning uses of CFCs present a challenge to DOE, as well as other industrial users of these applications, because of the limited number of approved CFC alternatives currently available. The estimated costs associated with retrofitting or replacing refrigerant equipment are high, and there is some concern over whether sufficient production capacity exists to meet the demand for equipment and retrofits from all consumers. On the other hand, there is also concern that DOE facilities and other users of CFC refrigerants may have difficulty obtaining sufficient quantities of these chemicals to service existing needs. To assist DOE facilities in planning for CFC phaseout, DOE Headquarters contracted with PNL to develop a Refrigerant Management Plan that uses a life-cycle cost analysis based on the equipment's remaining useful life.

842 (RFP–4787) **Integrating Total Quality Management (TQM) and hazardous waste management.** Kirk, N. (Colorado State Univ., Fort Collins, CO (United States)). EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. Fal 1993. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE94002306. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Colorado State Univ., Fort Collins, CO.

The Resource Conservation and Recovery Act (RCRA) of 1976 and its subsequent amendments have had a dramatic impact on hazardous waste management for business and industry. The complexity of this law and the penalties for noncompliance have made it one of the most challenging regulatory programs undertaken by the Environmental Protection Agency (EPA). The fundamentals of RCRA include "cradle to grave" management of hazardous waste, covering generators, transporters, and treatment, storage, and disposal facilities. The regulations also address extensive definitions and listing/identification mechanisms for hazardous waste along with a tracking system. Treatment is favored over disposal and emphasis is on "front-end" treatment such as waste minimization and pollution prevention. A study of large corporations such as Xerox, 3M, and Dow Chemical, as well as the public sector, has shown that well known and successful hazardous waste management programs emphasize pollution prevention and employment of techniques such as proactive environmental management, environmentally conscious manufacturing, and source reduction. Nearly all successful hazardous waste programs include some aspects of Total Quality Management, which begins with a strong commitment from top management. Hazardous waste management at the Rocky Flats Plant is further complicated by the dominance of "mixed waste" at the facility. The mixed waste stems from the original mission of the facility, which was production of nuclear weapons components for the Department of Energy (DOE). A Quality Assurance Program based on the criterion in DOE Order 5700.6C has been implemented at Rocky Flats. All of the elements of the Quality Assurance Program play a role in hazardous waste management. Perhaps one of the biggest waste management problems facing the Rocky Flats Plant is cleaning up contamination from a forty year mission which focused on production of nuclear weapon components.

843 (SNV–4155) **Experience from CFC phaseout: Additional control instruments for HCFCs.** Hagbarth, U.; Loevgren, K.; Morthensen, K. Swedish Environmental Protection Agency,

Solna (Sweden). Oct 1992. 56p. Order Number DE94709797. Source: OSTI; NTIS.

English language version of SNV–4145.

In the present report, it is concluded that a maximum incentive effect for a limitation of HCFC use can probably be achieved by: banning the use of XPS manufactured with HCFCs from 1995, except for ground insulation of roads and railways. HCFC use within the last-named areas should also be banned as from the year 2000;. banning HCFC use in district heating pipes from 1995;, banning HCFC use in PUR insulation from 1995, except for those applications that are classified in the CFC phaseout as special insulation purposes, where use is prohibited from 1998;, a charge of SEK 300 per kg will be introduced from 1995 on HCFC use as refrigerants in bulk and in products, with a revision of the level when experience has been gained. By "use" is meant here quantities not already banked in existing equipment;, a charge of SEK 600 per kg of CFCs will be introduced from 1995 on use of newly-manufactured CFCs and CFCs that can be used as refrigerants;, and introducing an environmental declaration within the refrigeration sector. Because the charges on HCFCs and CFCs are limited to their use as refrigerants, the administration of the charge system is simplified. Service and installation companies are affected to a small extent, but quite a few plant owners may incur high costs. This is particularly true of grocery stores with old plants. The environmental charge revenues create scope for giving financial assistance to conversions of older existing equipment, which may be needed, particularly in an initial phase. An incentive effect is achieved for a substantial portion of the HCFC usage. The ban on XPS - extruded polystyrene - affects 2 manufacturers and 2-3 importers. The recommendations for additional bans on certain applications must be accompanied by equivalent import restrictions, along the same lines as the restrictions that have already been imposed on certain imports of certain categories of products manufactured with CFCs and HCFCs.

844 (SNV–4173) **Charges, taxes and subsidies with connection to environmental protection.** Swedish Environmental Protection Agency, Solna (Sweden). 1993. 102p. (In Swedish). Order Number DE94709800. Source: OSTI; NTIS.

The report presents existing swedish charges, taxes and subsidies that are connected to environmental protection. It also explains the sense of the law, what authorities are responsible for its applications, the amounts, the relevant legislation et cetera. All laws up to Feb 16 are included.

845 (WHC-EP–0682) **Hazardous Materials Management and Emergency Response training Center needs assessment.** McGinnis, K.A. (Westinghouse Hanford Co., Richland, WA (United States)); Bolton, P.A.; Robinson, R.K. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001156. Source: OSTI; NTIS; INIS; GPO Dep.

For the Hanford Site to provide high-quality training using simulated job-site situations to prepare the 4,000 Site workers and 500 emergency responders for known and unknown hazards a Hazardous Materials Management and Emergency Response Training Center is needed. The center will focus on providing classroom lecture as well as hands-on, realistic training. The establishment of the center will create a partnership among the US Department of Energy; its contractors; labor; local, state, and tribal governments; and Xavier and Tulane Universities of Louisiana. This report presents the background, history, need, benefits, and associated costs of the proposed center.

846 (WHC-SA–1797-Rev.1) **Modified risk evaluation method.** Udell, C.J.; Tilden, J.A.; Toyooka, R.T. Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930749–79-Rev.1: 34. annual meeting of the Institute of Nuclear Materials Management, Scottsdale, AZ (United States), 18-21 Jul 1993). Order Number DE94002199. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to provide a structured and cost-oriented process to determine risks associated with nuclear material and other security interests. Financial loss is a continuing concern for US Department of Energy contractors. In this paper risk is equated with uncertainty of cost impacts to material assets or human resources. The concept provides a method for assessing the effectiveness of an integrated protection system, which includes operations, safety, emergency preparedness, and safeguards and security. The concept is suitable for application to sabotage evaluations. The protection of assets is based on risk associated with cost impacts to assets and the potential for undesirable events. This will allow managers to establish protection priorities in terms of the cost and the potential for the event, given the current level of protection.

847 (WINCO–11968) **Quality data validation: Comprehensive approach to environmental data validation.** Matejka, L.A. Jr. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (CONF-9309139–9: 20. American Society for Quality Control (ASQC) national energy and environmental annual conference, Indian Wells, CA (United States), 19-22 Sep 1993). Order Number DE94000925. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental data validation consists of an assessment of three major areas: analytical method validation; field procedures and documentation review; evaluation of the level of achievement of data quality objectives based in part on PARCC parameters analysis and expected applications of data. A program utilizing matrix association of required levels of validation effort and analytical levels versus applications of this environmental data was developed in conjunction with DOE-ID guidance documents to implement actions under the Federal Facilities Agreement and Consent Order in effect at the Idaho National Engineering Laboratory. This was an effort to bring consistent quality to the INEL-wide Environmental Restoration Program and database in an efficient and cost-effective manner. This program, documenting all phases of the review process, is described here.

2904 Energy Resources

Refer also to citation(s) 851

2905 Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 63, 508, 577, 590, 872, 873, 883, 1059, 1100

848 (ANL/DIS/RP–80855) **Diffusion of irreversible energy technologies under uncertainty.** Cacallo, J.D.; Sutherland, R.J. Argonne National Lab., IL (United States). Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001358. Source: OSTI; NTIS; GPO Dep.

This paper presents a model of technology diffusion is consistent with characteristics of participants in most energy markets. Whereas the models used most widely for empirical research are based on the assumption that the extended delays in adoption of cost-saving innovations are the result of either lack of knowledge about the new processes or heterogeneity across potential adopters, the model presented in this paper is based on the strategic behavior by firms. The strategic interdependence of the firms' decisions is rooted in spillover effects associated with an inability to exclude others from the learning-by-doing acquired when a firm implements a new technology. The model makes extensive use of recent developments in investment theory as it relates irreversible investments under uncertainty.

849 (CONF-9308180–2) **Licensing and "CRADA's" in Oak Ridge technology transfer.** Prosser, G.A. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. annual model conference on waste management and environmental restoration; Oak Ridge, TN (United States); 23-26 Aug 1993. Order Number DE94000902. Source: OSTI; NTIS; GPO Dep.

In the belief that effective technology transfer is a contact sport, Martin Marietta Energy Systems (Energy Systems), the Department of Energy's (DOE's) management contractor in Oak Ridge, Tennessee, encourages its research and engineering employees to directly interact with their commercial-sector counterparts. Over the years, relationships which have been initiated through such technical interactions have led to many of the patent licenses ad cooperative research and development agreements (CRADAs) which currently exist among Energy Systems, US companies, universities, and industrial consortia. The responsibility for creating and implementing Energy Systems policies and procedures to accomplish DOE's technology transfer objectives in Oak Ridge lies with the Office of Technology Transfer (OTT). In addition, licensing executives within OTT are responsible for negotiating the terms and conditions of patent licenses and CRADAs for the commercialization of government-funded technologies and research expertise. Other technology transfer initiatives in Oak Ridge help companies in a wide range of industries overcome manufacturing obstacles, enabling them to retain existing jobs and to create new business opportunities.

850 (EGG-PIR–10633(2Q-93)) **Performance indicators for 2nd quarter CY 1993.** EG and G Idaho, Inc., Idaho Falls, ID (United States). 1993. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002837. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has established a Department-wide Performance Indicator (PI) Program for trending and analysis of operational data as directed by DOE Order 5480.26. The PI Program was established to provide a means for monitoring the environment, safety, and health (ES&H) performance of the DOE at the Secretary and other management levels. This is the tenth in a series of quarterly reports generated for the Department of Energy Idaho Operations Office (DOE-ID) by EG&G Idaho, Inc. to meet the requirements of the PI Program as directed by the DOE Standard (DOE-STD-1048-92). The information in this tenth quarterly report, while contributing to a historical database for supporting future trending analysis, does not at this time provide a sound basis for developing trend-related conclusions. In the future, it is expected that trending and analysis of operational data will enhance the safety culture in both DOE and contractor organizations by providing an early warning of deteriorating environment, safety, and health conditions. DOE-STD-1048-92 identifies four general areas of PIs. They are: Personnel Safety, Operational Incidents, Environment, and Management. These four areas have been subdivided into 26 performance indicators. Approximately 115 performance indicator control and distribution charts comprise the body of this report. A brief summary of PIs contained in each of these general areas is provided. The four EG&G facilities whose performance is charted herein are as follows: (1) The Advanced Test Reactor (ATR), (2) The Radioactive Waste Management Complex (RWMC), (3) The Waste Experimental Reduction Facility (WERF), and (4) The Test Reactor Area (TRA) Hot Cells.

851 (NEDO-P–9177) **Basic investigation on feasibility of verification researches for new energy technologies in Asian developing countries (Nepal, Mongolia and Bhutan).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 132p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714893. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A basic investigation has been carried out on feasibility for performing joint verification researches on new energy technologies being developed in Japan with Asian developing countries (Nepal, Mongolia, and Bhutan). Nepal has abundant new energy resources including mini-hydropower, solar energy, wind power, and biomass energy. Among them, the mini-hydropower generation is applied to electrification of communities. Other energy sources are also used though in small scales. The Royal Nepal Academy of Science and Technology is actively engaged in efforts for the research and development of new energies. The energy policy of the Mongolian Government calls for expansion of coal burning thermal power plants with the abundant coal availability as the background, and development of new energies to reduce import of liquid fuels. The research and development on new energy has been conducted by the Renewable Energies Scientific Production Corporation. The Bhutan's energy policy is to develop mini-hydropower stations using inexhaustible hydraulic power in an attempt to replace the conventional fuel resources of firewoods and charcoals with electric power. The agency to be dealt with is the Department of Electric Power of the Ministry of Trade, Industry and Electric Power. 7 figs., 40 tabs.

852 (NEDO-P–9178) **Basic investigation on feasibility of verification researches for new energy technologies in ASEAN countries (Thailand and Indonesia). Part 3.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1992. 88p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714894. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A survey was carried out by NEDO on feasibility of verification researches for new energy and energy saving technologies in Thailand and Indonesia. Explanations were given to persons concerned in the Thai and Indonesian governments on summaries of the subjects under discussion in Japan and their future budgetary procedures for technical cooperations in the new energy and energy saving technologies, based on the items of interest in both countries shown through the consultations held so far. Items to be prepared and shared by both countries when the subjects are put into implementation were summarized. A request was given on early discussion on manpower and physical burdens to be shared by the opponent countries. Thailand requested provision of information at good timings on budgets during the period from October 1992 through September 1993. In Indonesia, since JICA has been conducting investigations on developing a hybrid solar cell system, items realizable for the time being will begin to accumulate experiences. Positive discussions will be given on a material preheating equipment used in steel making electric furnaces.

853 (NEDO-P–9179) **Basic investigation on feasibility of verification researches for new energy technologies in ASEAN countries (Thailand and Indonesia). Part 4.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 136p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714895. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Based on the results of the investigations carried out by NEDO with Thailand, Indonesia and Malaysia, this paper summarizes the contents of the consultations at the NEDO's visits to the countries in March 1992. The consultations have been given on the implementation and possibility for the joint verification researches on new energy and energy conservation under discussion in Japan. The agenda taken up in Thailand included mild gasification of peat, battery-charging stations using photovoltaic power, manufacturing alcohol from tapioca, simplified industrial waste water purification, and high-efficiency residual oil combustors, for which DEDP will give special endeavor for the developments. The agenda in Indonesia were addressed to raw material preheating equipment used in steel making electric furnaces and effective biomass utilization. The country has a great interest especially in the energy saving project for electric furnaces. The working organization is the Ministry of Mine Energy or the Ministry of Industry. The agenda in Malaysia was made up of accelerated verification researches on photovoltaic power generation under tropical conditions, basic surveys on improving the oil consumption efficiency, and an effective biomass utilization survey.

854 (NEDO-P–9257) **Feasibility study concerning new energy technology development cooperation in Brazil.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 23p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714905. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development

Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

An investigation was made on energy development in Brazil on the assumption that developmental cooperation will be given to the country. The nation's new energy policy is intended to alleviate dependence on imports of underground resource energy, with petroleum as the main item, and to preserve environments. Hydroelectricity and biomass energy constitute the strategic sectors of the policy in particular. ELETROBRAS (Brazilian Electric Power Public Corporation) needs investments amounting to 34 billion dollars during a period of five years starting 1993. These investments will be impossible because of the economic recession, and power supply shortage is anticipated after 1995. Power supply is envisaged from natural gas burning thermal power generation and surplus power from the sugar cane alcohol department. There are about ten companies currently which have surplus power supply capacity, which will exceed 500 companies in the future. The next step would be gasification of bagasses, which is important to expand power generation capacities and improve economic performance of alcohol production. It will take, however, eight to ten years before completion of relevant technologies. Technologies related to natural gas utilization and bagasse gasification are the important technological assignments for Brazil. 7 refs., 1 fig.

855 (NREL/CP–320-5717) **Fourth annual workshop on management in basic and applied research environments.** Bodnarczuk, M.W. (ed.). National Renewable Energy Lab., Golden, CO (United States). [1993]. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. (CONF-9303111–Suppl.: 4. annual workshop on management in basic applied research environments, Stanford, CA (United States), 3-4 Mar 1993). Order Number DE93018231. Source: OSTI; NTIS; GPO Dep.

The struggle to develop quality management concepts that "map" onto the cultural and work practices found in basic and applied research environments has been (for better or for worse) an attempt to differentiate basic and applied research from the nuclear industry. In the first (1990) edition of this "Music Book" proceedings, almost every laboratory that participated had a quality program that was traceable to, based on, influenced by, or in reaction to the nuclear quality standard ASME-NQA-1. This 1993 edition of the "Music Book" is very different in that almost every laboratory has developed a quality program that is based on, traceable to, or heavily influenced by DOE 5700.6C (Quality Assurance) and the DOE Standard; Implementation Guide for Quality Assurance Programs for Basic and Applied Research (DOE-ER-STD-6001-92). In order to construct a context for what follows and properly introduce the contents of this book, we want to briefly recount some of the highlights of the events that brought about this change, from the perspective of one who participated in the process.

2906 Nuclear Energy

Refer also to citation(s) 374, 723, 850

2907 Transport and Storage

Refer also to citation(s) 575

2908 Heat Utilization

Refer also to citation(s) 928, 929

2910 Conservation

Refer also to citation(s) 23, 28, 78, 852, 853, 907, 928, 930, 973, 1003, 1380

856 (ETDE/JP-mf–94714745) **Successful cases of energy conservation.** Energy Conservation Center, Tokyo (Japan). 1992. 99p. Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-39-3 Nishi-Shinbashi, Minato-Ku, Tokyo, Japan.

The Energy Conservation Center, Japan has compiled 1992 successful cases of energy conservation. Fifteen excellent cases of energy conservation are collected. The present proceedings introduces energy conservation activities and their effects, as for improvement of cleaning method for heat exchanger of recovery boiler, operation change performed at the acid pickling line in advance, development of a self-rotation type air blowing nozzle, reduction of coke oven heat consumption by means of coal moisture control plant for coke oven batteries, reduction of reflux ratio at aromatics recovery tower of benzene plant, utilization of computer that even operating staff could do, utilization of industrial waste as fuel, air-blowing for press sheet loader, air-conditioning chiller water supply system, exhaust heat recovery for sintering machine, reduction in basic unit of fuel used for reheating furnace, incinerating wastes, optimization of vapor pressure control system, and air separator with adding liquid oxygen/nitrogen. 102 figs., 33 tabs.

857 (ETDE/JP-mf–94714745, pp. 82-88) **Reduction in basic unit of fuel to be used for reheating furnace.** Sumitomo Metal Industries Ltd., Osaka (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

The reheating furnace consumed at least 60 % of energy used by the entire cogging plant. Analysis showed that temperature at the center of the reheated bloom was lower than that at the both end, and the temperature of the area on the bloom dropped which came into contact with the skid of the walking beam. For improvement of temperature distribution in longitudinal direction of the bloom, extension of the burner flame was performed. Concretely, an opening was installed to rake out the built-up scale on the oven bed, and the flame inspection window was remodeled to confirm the flame length daily. For improvement of temperature difference at skid marks, a scale remover was developed and installed, being based on a fact that the built-up scale on the skid blocked the radiant heat transfer. Furthermore, it was found as for the oven operation that the delayed change of the setting of oven temperature or the different skill of each operator caused wasteful fuel burning. Therefore, the know-how presented by operators was computerized as the combustion control program. As effects of these improvements, reduction of 4000 kcal/ton in unit consumption of fuel was achieved. 9 figs., 3 tabs.

858 (ETDE/JP-mf–94714761) **Japan energy conservation handbook.** Energy Conservation Center, Tokyo (Japan). 1992. 58p. Order Number DE94714761. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

This book consists of six chapters. In [1] Recent energy situation, the recent situation of energy consumption and supply in Japan and the world is shown using graphs and tables. In [2] Global environment and energy conservation, the relationship between global environmental changes and energy consumption is shown by data. In [3] Outline of energy conservation policy, outline of the law, tax system, financial aid, and encouraging activities for promotion of energy conservation is shown. In [4] Energy conservation technology R&D systems(moonlight project), outline of the governmental moonlight project is described and the expanded plans of the R&D projects until fiscal 2001 are introduced by each sub-theme and by every fiscal year. In [5] Developments in energy conservation and energy conservation measures, developments in energy conservation until fiscal 1991 is shown by data, and the measures and developments in manufacturing industries as well as household, home electric appliances, and transportation are described. In [6], 'The Energy Conservation Center, Japan' is introduced.

859 (LBL–34412) **Electric motor systems in developing countries: Opportunities for efficiency improvement.** Meyers, S. (Lawrence Berkeley Lab., CA (United States)); Monahan, P.; Lewis, P.; Greenberg, S.; Nadel, S. Lawrence Berkeley Lab., CA (United States). Aug 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94000727. Source: OSTI; NTIS; GPO Dep.

This report presents an overview of the current status and efficiency improvement potential of industrial motor systems in developing countries. Better management of electric motor systems is of particular relevance in developing countries, where improved efficiency can lead to increased productivity and slower growth in

electricity demand. Motor systems currently consume some 65–80% of the industrial electricity in developing countries. Drawing on studies from Thailand, India, Brazil, China, Pakistan, and Costa Rica, we describe potential efficiency gains in various parts of the motor system, from the electricity delivery system through the motor to the point where useful work is performed. We report evidence of a significant electricity conservation potential. Most of the efficiency improvement methods we examine are very cost-effective from a societal viewpoint, but are generally not implemented due to various barriers that deter their adoption. Drawing on experiences in North America, we discuss a range of policies to overcome these barriers, including education, training, minimum efficiency standards, motor efficiency testing protocols, technical assistance programs, and financial incentives.

860 (PNL–8838) **Mobile Energy Laboratory Procedures.** Armstrong, P.R.; Batishko, C.R.; Dittmer, A.L.; Hadley, D.L.; Stoops, J.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000724. Source: OSTI; NTIS; GPO Dep.

Pacific Northwest Laboratory (PNL) has been tasked to plan and implement a framework for measuring and analyzing the efficiency of on-site energy conversion, distribution, and end-use application on federal facilities as part of its overall technical support to the US Department of Energy (DOE) Federal Energy Management Program (FEMP). The Mobile Energy Laboratory (MEL) Procedures establish guidelines for specific activities performed by PNL staff. PNL provided sophisticated energy monitoring, auditing, and analysis equipment for on-site evaluation of energy use efficiency. Specially trained engineers and technicians were provided to conduct tests in a safe and efficient manner with the assistance of host facility staff and contractors. Reports were produced to describe test procedures, results, and suggested courses of action. These reports may be used to justify changes in operating procedures, maintenance efforts, system designs, or energy-using equipment. The MEL capabilities can subsequently be used to assess the results of energy conservation projects. These procedures recognize the need for centralized NM administration, test procedure development, operator training, and technical oversight. This need is evidenced by increasing requests fbr MEL use and the economies available by having trained, full-time MEL operators and near continuous MEL operation. DOE will assign new equipment and upgrade existing equipment as new capabilities are developed. The equipment and trained technicians will be made available to federal agencies that provide funding for the direct costs associated with MEL use.

2920 Supply, Demand, and Forecasting

Refer also to citation(s) 854

2930 Policy, Legislation, and Regulation

Refer also to citation(s) 92, 823, 839, 854, 978

861 (SNV–4143, pp. 23-75) **Model calculations for Sweden's energy supply with carbon dioxide limitations.** Swedish Environmental Protection Agency, Solna (Sweden). 1992. (In Swedish). In *Model studies of limitation of carbon dioxide emissions reduction.* 75p. Order Number DE94702213. Source: OSTI; NTIS.

Basic data to SNV–4120.

Costs and economic effects of Swedish limitations of carbon dioxide emissions have been calculated under different assumptions about mitigation measures applied in other countries. Effects on GNP, GNI and on production in different sectors of industry are calculated for the year 2000. (5 refs., 5 tabs.)

2940 Fossil Fuels

Refer also to citation(s) 37, 63, 64, 65, 66, 83, 97, 135, 155, 830

862 (NEDO-C–9202, pp. 1-11) **New coal policies focused on international cooperations.** Okumura, K. (Agency of Natural Resources and Energy, Tokyo (Japan)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture on Japan's coal policies given by a Japanese representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). Coal will remain as one of the important resources now and hereafter. Especially in the Pan-Pacific areas, its rapid demand increase is anticipated for power generation as a main application. Also in Japan, figures in plans for installing coal burning power plants in the fiscal year 2001 is 2.7 time that in 1990. On the other hand, measures for global environmental problems are indispensable. Japan who is the world's largest coal importing country is demanded to promote clean coal utilization and international contributions. To help achieve these objectives, development promotional measures are planned in the following areas: Stable supply of overseas coals through investigations, developments and environmental improvements; improvement of thermal efficiency; melting and reducing steel making technology; pressurized, fluidized bed combustion; coal ash utilization; and clean coal technologies including use of CWM. Active international cooperations and assistances will be moved forward, as exemplified by opening of the technical center in October 1992. 2 figs., 5 tabs.

863 (NEDO-C–9202, pp. 70-77) **Trends in and prospects on coal energy in Malaysia.** Husin, Z. (Tenaga National Berhad (Malaysia)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture given by a Malaysian representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). The lecture discusses prospects for coal demand and supply, problems and prospects on development in Malaysia. Malaysia is blessed with abundant resources such as petroleum, natural gas, water, and coal. Natural gas would be used as a main fuel for power generation until 2000, but the nation has a possibility to become a large coal producing country at the same time, with its reserve of about 1 billion tons. However, materializing this possibility requires producing coals at competitive prices and with quality accepted by final consumers. Future coal supply will be required to meet more rigorous environmental regulations. To overcome these barriers, it is necessary to select carefully optimal technologies for coal development. Clean coal technologies that would be made available are expected to produce convenient and economical supply while suppressing effects on global environment. 1 fig., 1 tab.

864 (NEDO-C–9202, pp. 78-89) **Trends in and prospects on coal as energy source and its problem in the Philippines.** Bomasang, R. (Department of Energy (Philippines)); Quebral, M. New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture given by a Filipino representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). The lecture discusses prospects for coal demand and supply, problems and prospects on development in the Philippines. All the developing countries in Asia and the Pan-Pacific territories are facing a situation that petroleum supply from inside and outside the territories is decreasing. The Philippines has

adopted an energy self-supply policy, and attaches importance on coal along with terrestrial heat as main indigenous fuel sources. According to the latest plan, the coal demand is estimated to grow from 3.5 million tons in 1993 to 12.1 million tons in 2000. Based on this estimation, various political measures are being carried out on coal production, import/export regulations, and coal utilization. Coal has been assigned as one of the stanchions in the power development projects to accelerate developing coal resources. Maintaining the environment will require further studies, developments, and verifications of clean coal technologies. 1 fig., 1 tab.

865 (NEDO-C–9202, pp. 90-95) **Prospects on coal in Taiwan and its problems.** Wang, Y. (Ministry of Economical Affairs, Taipei (Taiwan, Province of China)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture given by a Taiwanese representative at the Pan-Pacific Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). The lecture discusses prospects for coal demand and supply, and problems that locally produced coals hold in Taiwan. The nation's coal demand is increasing sharply now, with most of its supply depending on import. While the demand is estimated to double in 2010 from 22 million MT in 1992, the local industry, which still depends on the governmental protection, produces only 334,000 MT in 1992, and the production is believed to decrease in future. In addition, coal is a disadvantageous energy for environmental protection as it discharges polluting substances, which is receiving objections of public opinion. To change this situation, technical breakthroughs are necessary on coal utilization. Although the government has not signed the basic treaty concerning climate change, it is implementing different measures under a determination of recognizing and observing the importance of international cooperations. 3 figs., 4 tabs.

866 (NEDO-C–9202, pp. 96-106) **Coal and environment in Thailand.** Poom-im, S. (Department of Mineral Resource, Bangkok (Thailand)). New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. (In Japanese). In *Survey on research and development aiding operations subsidized by coal production and utilization technology promotional fund.: Third Pan-Pacific coal workshop, 1992.* 117p. Order Number DE94714906. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper summarizes a lecture given by a Thai representative at the Pacific-rim Workshop, 1992 (sponsored by NEDO and held at Kuching, Malaysia). The lecture discusses circumstances in the nation's coal industry and movements of efforts in resolving environmental problems in Thailand. While power generation is sufficed with self-supplied coal currently, demand in industrial areas must be filled up with import. Coals produced in Thailand are mainly those with high sulfur and volatile substances, ranging from brown coal to sub-bituminous coal. The coals are distributed in several basins in the north mountainous area. Their geological reserve is reported as about 2 billion MT. Coal would remain one of the main energy resources in Thailand as its electric power demand increases at as sharply high rate as now. The nation is facing environmental problems as a result of the expanded power demand. No environmental regulations have been established up to now either upstream or downstream the pollution sources. Systems to overcome the problems have been organized, and preparations and plans are being moved forward to establish rules and guidelines. 1 fig., 5 tabs.

867 (SNV–4186) **Strategies to prevent climate change.** Swedish Environmental Protection Agency, Solna (Sweden). Oct 1992. 193p. Order Number DE94709802. Source: OSTI; NTIS.

A summary with identical title is available, SNV–4187.

In Sweden, carbon dioxide accounts for approximately 80 % of the total contributions to the greenhouse effect. The technical studies that have been done show that a great potential exists for reducing carbon dioxide emissions by means of efficiency improvements and changing over to other energy sources. An initial interim target should be to stabilize these emissions at the 1990 level from the year 2000. It is mainly within the energy and transport sectors that these changes must take place. Measures to reduce emissions for these sectors are proposed. The report describes how we can limit other greenhouse gases and what policy instruments are required to limit the harmful effects of a temperature rise. The report also deals with emissions and countermeasures against the greenhouse gases in an international perspective. Emissions of greenhouse gases in Sweden 1990 from different sectors of society are given for different fuels. (A summary with identical title is presented as a separate report, SNV-4187). 59 refs, 22 figs, 34 tabs.

2960 Electric Power

Refer also to citation(s) 822, 874

868 (ANL/DIS/CP–81110) **Synergies and conflicts in multimedia pollution control related to utility compliance with Title IV of the Clean Air Act Amendments of 1990.** South, D.W.; Bailey, K.A. Argonne National Lab., IL (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930835–1: EPRI/EPA/DOE sulfur dioxide control symposium, Boston, MA (United States), 24-27 Aug 1993). Order Number DE94002211. Source: OSTI; NTIS; GPO Dep.

Most analyses of the alternative strategies used by utilities to comply with Title IV requirements have focused on factors directly related to controlling sulfur dioxide (SO_2) emissions. However, utilities must meet a number of additional environmental requirements at the same tune they comply with the acid rain program. To illuminate the potential synergies and conflicts that might exist between the other regulatory mandates and the acid rain program, a thorough examination of all the various programs and their interrelationships must be conducted. This paper reviews the environmental mandates that utilities will have to plan to meet in the next decade concurrently with the acid rain program, and it analyzes the interactions among the various programs to identify potential synergies and conflicts.

869 (DOE/EIA–0226(93/07)) **Electric power monthly, July 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. 29 Jul 1993. 188p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93018401. Source: OSTI; NTIS; GPO; GPO Dep.

The Electric Power Monthly (EPM) presents monthly electricity statistics. The purpose of this publication is to provide energy decisionmakers with accurate and timely information that may be used in forming various perspectives on electric issues that lie ahead. Data in this report are presented for a wide audience including Congress, Federal and State agencies, the electric utility industry, and the general public. The EIA collected the information in this report to fulfill its data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (Public Law 93-275) as amended.

870 (ORNL/CON–372) **Statistical recoupling: A new way to break the link between electric-utility sales and revenues.** Hirst, E. Oak Ridge National Lab., TN (United States). Sep 1993. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001938. Source: OSTI; NTIS; GPO Dep.

In 1991, US electric utilities spent almost $1.8 billion on demand-side management (DSM) programs. These programs cut peak demands 5% and reduced electricity sales 1% that year. Utility projections suggest that these reductions will increase to 9% and 3%, respectively, by the year 2001. However, utility DSM efforts vary enormously across the country, concentrated in a few states along the east and west coasts and the upper midwest. To some extent, this concentration is a function of regulatory reforms that remove disincentives to utility shareholders for investments in DSM programs. A key component of these reforms is recovery of the net

lost revenues caused by utility DSM programs. These lost revenues occur between rate cases when a utility encourages its customers to improve energy efficiency and cut demand. The reduction in sales means that the utility has less revenue to cover its fixed costs. This report describes a new method, statistical recoupling (SR), that addresses this net-lost-revenue problem. Like other decoupling approaches, SR breaks the link between electric-utility revenues and sales. Unlike other approaches, SR minimizes changes from traditional regulation. In particular, the risks of revenue swings associated with year-to-year changes in weather and the economy remain with the utility under SR. Statistical recoupling uses statistical models, based on historical data, that explain retail electricity sales as functions of the number of utility customers, winter and summer weather, the condition of the local economy, electricity price, and perhaps a few other key variables. These models, along with the actual values of the explanatory variables, are then used to estimate "allowed" electricity sales and revenues in future years.

871 (SIB-SB–44) **Swedish and international energy markets: Studies and opinions 1988-1991.** Wickman, K. National Swedish Inst. for Building Research, Gaevle (Sweden). Jan 1992. 311p. (In Swedish). Order Number DE94709821. Source: OSTI; NTIS.

This collection of papers is centered around studies of power markets. The growing EEC electricity market is discussed in two larger studies, where some incentives and obstacles to a fully integrated European market are documented. One conclusion from these studies is that the long-term power trade between different countries has been widened much during the 1980s. Those incentives that explain this trend will remain strong also during the 1990s. The heavy dependence of the Swedish economy on power is the second leading theme in the book. In several papers the observation is discussed, that the effort to conserve energy has been successful for all energy carriers but electricity. Both the electricity use per produced unit in industry and the electricity content of GNP have been continuously growing, even when consumption of other energy carriers has been reduced. (author) figs., tabs., refs.

2980 Consumption and Utilization

Refer also to citation(s) 960, 961

2990 Unconventional Sources and Power Generation

Refer also to citation(s) 560, 575, 854, 950

872 (NEDO-P–9203) **Current situation in developing petroleum substituting energy (the United Kingdom).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 72p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714897. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A survey was made to identify the trends in developing petroleum substituting energies in the United Kingdom. The UK has abundant coal resources, produces petroleum and natural gas in addition, and is the only energy self-sustaining country in the EC. However, coals for power generation have been replaced with overseas coals and natural gas because of inferior price competitiveness. The coal mine close-down bill has turned to a social problem. Petroleum is also losing its price competitiveness as the oil reservoir beds go deeper and deeper. Demand for natural gas is increasing because of the new consolidation cycle type gas turbine power generation, but the natural gas is said to deplete in 30 years. Building new nuclear power plants has been discontinued. Government subsidies are sought for developing wave and wind power utilization to cope with the decreasing trend in energy self-sufficiency. With respect to harmony with environment, the government is attempting to solve the matter by applying the policies of energy conservation and renewable energy development. The energy saving policies are being promoted in power generation, power distribution, commerces and industries, buildings, and electric products. For renewable energies, the Non-Fossil Fuel Obligation taxation system has already been applied extensively. 17 refs., 8 figs., 7 tabs.

873 (NEDO-P–9219) **Preliminary study concerning development of petroleum-substitution energy integration technology.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 172p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714902. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

With an objective to achieve compatibility among petroleum-substitution energy supply stability, energy efficiency, and energy demand, this paper discusses the energy utilization combining the conventional energy technologies. First, the currently available individual technologies related to energy supply were sorted out focusing on substitution energies, and then the energy demand characteristics by fields were identified for the combined utilization. Using the results, evaluations were given on all of the combinations of individual technologies using as parameters the demand characteristics, environment preserving effect, novelty, and supply stability. Parallel use with conventional technologies was represented by hybrid use of photovoltaic power generation with solar heat collectors, paralleling heat supply using wind power with biomass utilization, and photovoltaic power generation with fuel cells. Selected series use with conventional technologies include a Stirling engine using heat collected by solar heat collectors, coal liquefaction and gasification using underground heat, a heat pump driven by solar energy generated power, regional heat supply using underground heat, and biomass fuel cells. Followability to regional demand characteristics and demand variation is important. 98 figs., 51 tabs.

874 (NREL/TP–463-4953) **Factors relevant to utility integration of intermittent renewable technologies.** Wan, Yih-huei; Parsons, B.K. National Renewable Energy Lab., Golden, CO (United States). Aug 1993. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93017080. Source: OSTI; NTIS; GPO Dep.

This study assesses factors that utilities must address when they integrate intermittent renewable technologies into their power-supply systems; it also reviews the literature in this area and has a bibliography containing more than 350 listings. Three topics are covered: (1) interface (hardware and design-related interconnection), (2) operability/stability, and (3) planning. This study finds that several commonly held perceptions regarding integration of intermittent renewable energy technologies are not valid. Among findings of the study are the following: (1) hardware and system design advances have eliminated most concerns about interface; (2) cost penalties have not occurred at low to moderate penetration levels (and high levels are feasible); and (3) intermittent renewable energy technologies can have capacity values. Obstacles still interfering with intermittent renewable technologies are also identified.

30 DIRECT ENERGY CONVERSION

3001 MHD Generators

875 (DOE/PC/79672–T7) **MHD seed recovery/regeneration: Phase 2, Technical progress report, quarter ending May 1993.** TRW, Inc., Redondo Beach, CA (United States). Applied Technology Div. [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-87PC79672. Order Number DE94001974. Source: OSTI; NTIS; GPO Dep.

The following tasks are reported: Design, refurbish, operation potassium formate ("backend") system (Seed Regeneration Proof-of- Concept Facility); design, construct, operate calcium formate production POC ("frontend") unit; project management and control; and Western seed studies.

3003 Thermoelectric Generators

Refer also to citation(s) 509, 510, 511, 512

876 (IS-M–767) **Large-scale production of $Si_{0.8}Ge_{0.2}$ thermoelectric alloys by mechanical alloying.** Cook, B.A. (Ames Lab., IA (United States)); Harringa, J.L.; Loughin, S.; Centurioni, D.X. Ames Lab., IA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-930804–20: 28. intersociety energy conversion engineering conference, Atlanta, GA (United States), 8-13 Aug 1993). Order Number DE94000695. Source: OSTI; NTIS; GPO Dep.

Advanced processing techniques were combined with refinements in composition to produce homogeneous, production-scale quantities of n- and p-type $Si_{0.8}Ge_{0.2}$ alloys with improved thermoelectric properties. Two p-type compacts of $Si_{0.8}Ge_{0.2}$ doped with 0.8 atom% boron and one n-type compact doped with 0.8 m/o GaP and a P/Ga ratio of 2.38 were prepared by mechanical alloying. Resulting powders were consolidated into 7.62 cm diameter compacts by vacuum hot pressing. Transport and thermoelectric properties were measured. As-pressed samples were found to have low carrier mobility. Metallographic analysis revealed a submicron grain size which would suggest a high density of grain boundary potential barriers. A heat treatment was applied and the measurements were repeated. The post-treatment p-type samples showed a 33% grain growth and an integrated average figure of merit of 0.6×10^{-3} K^{-1} over the 573–1273 K range. This paper presents the details of fabrication method and compares the thermoelectric properties with the properties of similar alloys manufactured by traditional vacuum casting and hot pressing.

3005 Fuel Cells

Refer also to citation(s) 578, 1086

877 (ANL/CMT/CP–79617) **The electrochemical performance of thin-electrolyte solid oxide fuel cells.** Zurawski, D.; Kueper, T. Argonne National Lab., IL (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931024–3: 184. meeting of the Electrochemical Society, New Orleans, LA (United States), 10-15 Oct 1993). Order Number DE93041184. Source: OSTI; NTIS; GPO Dep.

Several benefits are realized by lowering the operating temperature of solid oxide fuel cells (SOFCs) from 1000C to temperatures in the 600 to 800C range. Among the advantages are decreased reaction between fuel cell components, shorter startup times, and the possibility of using metals in stack construction; however, the achievable power density in conventional SOFCs is too low. A strategy for overcoming this limitation is to decrease the thickness of this layer by approximately an order of magnitude. Thin (5 μm) electrolyte SOFCs have recently been fabricated by Allied-Signal Aerospace Systems and Equipment Company (ASASE). The electrochemical performance of these cells has been studied and is discussed in this paper.

878 (ANL/CMT/CP–79775) **Cathode materials for the molten carbonate fuel cell.** Kucera, G.H.; Brown, A.P.; Roche, M.F.; Indacochea, E.J.; Krumpelt, M.; Myles, K.M. Argonne National Lab., IL (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930802–11: 206. American Chemical Society (ACS) national meeting, Chicago, IL (United States), 22-27 Aug 1993). Order Number DE93019515. Source: OSTI; NTIS; GPO Dep.

Both $LiFeO_2$ and Li_2MnO_3 were stable in the cathode environment, had low solubility, and were nonprecipitating in the anode environment. Dopants were employed to enhance the electronic conductivity of both materials. Cobalt-doped $LiFeO_2$ was a factor of 30 more conductive than the undoped $LiFeO_2$; Nb-doped Li_2MnO_3 was a factor of 60 more conductive than its undoped form. However, only the Co-doped $LiFeO_2$ Li_2 exhibited the desired p-type conduction. Half- and full-cell tests with Co-doped $LiFeO_2$ as the cathode material showed that its performance strongly depended on the oxygen partial pressure. Under simulated high-pressure conditions, where the O_2 partial pressure was 70 kPa, the performance was good. $LiCoO_2$ had low solubility and was a good electronic conductor undoped. In addition, it exhibited p-type conduction, and, when used as a cathode material, gave good cell performance. It precipitated as cobalt metal under reducing conditions in anode. However, neither rate of deposition nor conditions influencing deposition and location are known.

879 (ANL/CMT/CP–80587) **Modeling of polymer electrolyte fuel cell systems.** Kumar, R.; Ahluwalia, R.; Geyer, H.K.; Krumpelt, M. Argonne National Lab., IL (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310169–1: 1993 automotive technology development contractors' meeting, Dearborn, MI (United States), 18-21 Oct 1993). Order Number DE93041187. Source: OSTI; NTIS; GPO Dep.

Propulsion systems based on the polymer electrolyte fuel cell (PEFC) are being developed. This paper reports an analysis undertaken to design improved PEFC systems. A reference system design with some variants were set up for a methanol-fueled PEFC propulsion system. Efficiency improves from 38.4 to 44.1% as cell current density goes from 0.75 to 0.45 A/cm^2, while fuel cell efficiency increases from 52.6 to 60.0%; to get a net power output of 80 kWe, the active fuel cell area must increase from 18.8 to 27.3 m^2. Three parametric studies were conducted on the off-design performance of the reference system.

880 (BNL–49537) **A novel method for determination of transport parameters of H_2 and O_2 in PEMFCs.** Wakizoe, Masanobu (Texas A&M Univ., College Station, TX (United States). Center for Electrochemical Systems and Hydrogen Research); Kim, J.; Srinivasan, S.; McBreen, J. Brookhaven National Lab., Upton, NY (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC02-76CH00016. Grant NAG 3-1255. (CONF-930571–27: 183. Electrochemical Society meeting, Honolulu, HI (United States), 16-21 May 1993). Order Number DE94001492. Source: OSTI; NTIS; GPO Dep.

A knowledge of the transport parameters of hydrogen and oxygen in proton exchange membrane fuel cells (PEMFCs) is of vital importance for (1) an elucidation of the kinetics of the half-cell reactions, (2) analyzing mass transport phenomena in the electrodes and membranes, (3) estimating the cross-over currents during fuel cell operation, and (4) evaluating membranes from different manufacturers and selecting the most promising candidate. Previous studies to determine diffusion coefficients and solubilities of H_2 and O_2 in proton conducting membranes have rarely been made under fuel cell operating conditions.This paper deals with novel approaches to determine the transport parameters in PEMFCs using steady state and transient techniques. The transient technique, used by one of the authors (J. McB) in investigating hydrogen permeation through metals and alloys, proved to be the most desirable for this purpose. Experiments were conducted in PEMFCs with Asahi Chemical Aciplex®-S Membranes and DuPont's Nafion®-117 membranes. The diffusion coefficients (D) of H_2 and of O_2 are higher in the Nafion® membranes, while their solubilities (C_0) are higher in the Aciplex® membranes. The D values are higher for O_2 than for H_2 in both membranes while the opposite behavior is the case in respect to C_0 values. The values of activation energies for diffusion of H_2 or O_2 in the membrane are of the same order as in aqueous electrolytes. There is an anomalous temperature dependence of the solubilities of H_2 and O_2 in the two membranes. This is not the case with the product DC_0. The diffusion rate of H_2 through the membranes is higher than that of O_2.

881 (DOE/ER/81186–94/C0265) **Macrocyclic redox promoters for methanol oxidation.** Sarangapani, S. ICET, Inc., Norwood, MA (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER81186. (CONF-930893–14: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). Order Number DE94001924. Source: OSTI; NTIS; GPO Dep.

Goal is to develop catalyst promoters that will result in longer and better performance of the presently used platinum catalysts for

methanol oxidation. This paper discusses development of contaminant resistant Pt coated carbon anodes. Specific objectives are to synthesize inorganic macrocyclic complexes as promoters, to improve the reactivity of promoter core by means of mixtures and covalent attachment to the carbon substrate, to characterize the complexes, to conduct electrochemical studies of the promoters, to conduct half- cell screening studies, and to conduct direct methanol fuel cell experiments using polymer electrolyte membrane fuel cells.

882 (DOE/MC/27394–94/C0263) **Advanced research and technology development of MCFCs.** Benjamin, T.G.; Remick, R.J.; Donado, R.A. M-C Power Corp., Burr Ridge, IL (United States). 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27394. (CONF-930893–6: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). Order Number DE94001918. Source: OSTI; NTIS; GPO Dep.

Objective is to lower contact resistance losses associated with protective oxide layer that forms on the surface of stainless steel in the MCFC (molten carbonate fuel cell) cathode environment. Approach being taken is to coat the top surface of the stainless steel with a thin film of iron oxide. 316L stainless steel sheet metal was coated with 3-micron thick layer of Fe_2O_3 using jet vapor deposition. The films were examined by SEM/EDX and the conductivity measured. Resistance of cell with only a 316L separator was 0.116 ohm, while that of the cell with the iron oxide coated separator was 0.124 ohm.

883 (DOE/MC/28065–94/C0249) **Molten carbonate fuel cell product development test.** Scroppo, J.A.; Camara, E.H.; Figueroa, R.A. M-C Power Corp., Burr Ridge, IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28065. (CONF-930893–12: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). Order Number DE94001920. Source: OSTI; NTIS; GPO Dep.

M-C Power Corp. will design, fabricate, install, test, and evaluate a 250 kW Proof-of-Concept MCFC Power Plant. The plant will be located at Kaiser Permanente's San Diego Medical Center; it will be designed and built by Bechtel Corp. Two 250 keV MCFC stacks will be assembled and tested at M-C Power; one stack will be used to support the San Diego field demonstration. This report outlines 6 tasks: project management/permitting, demonstration design, stack manufacturing, BOP fabrication, site work, and testing.

884 (DOE/NBM–94000017) **Optical sensor development for MCFCs: HCl detection through wavelength modulation diode laser absorption spectroscopy.** Hanold, R.; Funk, D.J.; Palmer, B.A.; Oldenborg, R.C. Los Alamos National Lab., NM (United States). 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930893–4: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). Order Number DE94000017. Source: OSTI; NTIS; GPO Dep.

Contaminants in coal gas can degrade the performance of molten carbonate fuel cells. A laser diode sensor and a wavelength modulation spectrometer have been developed capable of detecting, in situ, HCl gas at ppM levels and below on time scales < 1 min, using 25 cm path lengths. Due to intensity and overlap of ^{18}OCO with P10 transition of HCl, sensitivity is somewhat limited (close to 100 ppB, however) because of limited S/N ratios; this will be improved by eliminating all etalon effects. Alternative HCl lines with possibly reduced spectral interference will be looked for. Detection of H_2S and H_2Se will also be investigated. It was found that room-temperature Li/K carbonate can be used as prefilter for HCl contaminants.

885 (ETDE-IT–93-228) **Phosphoric acid fuel cell: 50 kW demonstration plant.** Clerici, G. (Enericerche SpA, Milan (Italy)); Meli, S.; Quinto, V. 1992. 23p. (In Italian). (CONF-9211224–23: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716536. Source: OSTI; NTIS (US Sales Only).

Within the framework of Italian national efforts to promote the use of natural gas, the ENI Group began a fuel cell research program in 1990. The participation of ENIRICERCHE and SNAM (the Italian National Methane Pipelines Board) in the fuel cell research efforts involved the development of a demonstration program in which the energy efficiency, performance and potential applications of a 50 kW FUGI E1 phosphoric acid fuel cell were evaluated. Particular attention was given to a verification of the environmental compatibility of the cell and of its application in natural gas fuelled cogeneration systems. Conformity of the safety performance of this cell with safety standards specified by Italian law was also verified.

886 (ETDE-IT–93-231) **Fuel cell power plant for urban areas: Milan's 1 MW plant.** Haus, U. (Azienda Energetica Municipale, Milan (Italy)). 1992. 18p. (In Italian). (CONF-9211224–22: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716539. Source: OSTI; NTIS (US Sales Only).

Within the framework of research into new types of power generation plants capable of rationalizing the use of fossil fuels and minimizing environmental impacts, the USA and Japan began fuel cell research programs in the 1970's. This paper assesses the research progress that has been made and reviews the overall design, performance and operating features of fuel cell power plants. The paper then briefly outlines the key phases of the experimental work being conducted in Milan, Italy, on this city's 1 MW demonstration plant which makes use of two phosphoric acid fuel cells fed by natural gas. The testing program of this pilot plant is aimed at not only determining the plant's energy efficiency and operating reliability, but also its environmental compatibility and occupational safety characteristics.

887 (ETDE-IT–93-240) **Study on interfacial characteristics of porous nickel electrode for molten carbonate fuel cell by means of electrochemical impedance spectroscopy.** Giorgi, L. (ENEA, Casaccia (Italy). Area Energetica); Simonetti, E.; Pozio, A. 1992. 6p. (CONF-921114–6: Fuel cell seminar, Tucson, AZ (United States), 29 Nov - 2 dec 1992). Order Number DE94716592. Source: OSTI; NTIS (US Sales Only).

By means of electrochemical impedance spectroscopy (EIS), different phenomena occurring in the melt and at electrolyte/cathode interface of a molten carbonate fuel cell (MCFC) were investigated. By recording the EIS spectra at different temperatures a set of chemical and physical parameters were obtained, which result thermically activated. The calculated activation energies allowed researchers to characterize the system under study. Moreover, by means of a computer deconvolution program for EIS spectra, a parameter related to the charge transfer resistance was determinated. The charge transfer resistance can be related to the reaction orders for oxygen electroreduction, so it was possible to establish the reaction mechanism. An analysis was made of the influence of cathodic gas composition on the depression angle of the spectra, so that it was possible to establish the best cathodic atmosphere to obtain higher current from the cell. The relationship between melt composition and cathodic reaction was studied by electrode potential analysis. A computer program was developed to subtract the spectra depression and thus give a qualitative demonstration of interface phenomena.

888 (EUR–14430) **Optimisation of NIO cathode performance and endurance in molten carbonate fuel cells.** Makkus, R.C. (Laboratory for Materials Science, Delft (Netherlands)); Hemmes, K.; Witt, J.H.W. De. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 179p. Contract EN3E-0151-NL. Source: OSTI; NTIS (US Sales Only).

The state of the art NiO(Li) cathode of a molten carbonate fuel cell slowly dissolves into the matrix, reducing the lifetime of the fuel cell. The nickel is deposited in a band in the matrix. Both edges of this band, the cathodic and anodic band edge, move towards the anode in time. The nickel deposition and the movement towards the anode in time are explained by a flux model, involving the transport of nickel ions, peroxide, super oxide and hydrogen into the matrix. The movement of the band edges towards the anode is explained by a change in the tortuosity of the paste type matrix due to compression. The oxygen reduction in molten carbonate has been studied on a plane gold electrode submerged in a molten carbonate melt and on three different porous electrodes, made of

NiO(Li), $LiFeO_2$ (doped with either Mg or Co) and $LiCoO_2$. (author). 108 refs., figs., tabs.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

Refer also to citation(s) 96, 565, 859, 860, 960, 961, 1429, 2866

889 (BFR-D–5-93) **Demand controlled ventilation: Full scale tests in a conference room.** Ruud, S.H. (Swedish National Testing and Research Institute, Boraas (Sweden). Dept. of Energy Technology); Fahlen, P.; Andersson, Helena. Swedish Council for Building Research, Stockholm (Sweden). 1993. 61p. Project BFR-890451-5. Order Number DE94709816. Source: OSTI; NTIS.

Within IEA (International Energy Agency) a study is in progress on how demand controlled ventilation can be used both to save energy and to achieve indoor air of satisfactory quality. As a subproject of this work, a conference room at Swedish National Testing Institute was converted to demand controlled ventilation. By means of parallel coupled control units on the supply and extract sides, air flow rate was regulated over the range of 1.5-8.7 air changes per hour. The air flow rate was normally controlled by temperature. When the flow rate provided by the temperature control had a carbon dioxide content higher than 800 ppm, a carbon dioxide control was activated and increased the flow rate. Most of the time the system was only temperature controlled, due to large heat loads from the lighting. figs., tabs., refs.

890 (BFR-R–17-93) **Heat recovery from exhaust air: Long term performance of residential heat recovery ventilators.** Fahlen, P. (Swedish National Testing and Research Institute, Boraas (Sweden)); Karlsson, M.; Kovacs, P. Swedish Council for Building Research, Stockholm (Sweden). 1993. 135p. (In Swedish). Project BFR-870533-6. Order Number DE94709819. Source: OSTI; NTIS.

During 1983-1990 the Swedish National Testing and Research Institute investigated ten one-family houses equipped with mechanical exhaust/supply ventilation including heat recovery (commonly known as Heat Recovery Ventilators, HRV). The purpose of the investigation was to record the interrelationship between HRV, ventilation system, and building during long periods of operation. Measurements included sound-pressures, air-pressures inside the building, air flowrates, and air-leakage from ducts and HRVs. Airflowrates have changed considerable. Nine of the ten installations were in relatively good condition apart from dirty exhaust-air ducts. (author) figs., tabs., 26 refs.

891 (BFR-R–18-93) **Glass-covering of large building volumes: An interdisciplinary evaluation of a shopping centre.** Oeman, R. (Royal Inst. of Tech., Stockholm (Sweden). Dept. of Building Technology). Swedish Council for Building Research, Stockholm (Sweden). 1993. 311p. (In Swedish). Project BFR-890608-4. Order Number DE94709818. Source: OSTI; NTIS.

Systematized experiences of the function of large glass- covered spaces related to shopping centres, hotels, office buildings etc. are still relatively limited. With the glazed pedestrian precincts of the rebuilt Skaerholmen Centre in Stockholm as the main object of interdisciplinary studies, the aim of this thesis is to provide additional knowledge of large glass-covered spaces (atrium buildings). The studies comprises thermal comfort, temperature conditions, ventilation, energy balance, humidity - mycology, acoustics, operation - maintenance - durability and sociology. To sum up, it is clear that in the Scandinavian climate there is every likelihood of large glass-covered spaces in the public places functioning well from a technical as well as a social point of view. The energy consumption on heating the whole complex, based on theoretical calculations and measurement, is shown to have been reduced by the order of 10%. (author) figs., tabs., 101 refs.

892 (DOE/BP/25174–2) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 2, Item-by-item crosstabulations: Volume C, Pacific Northwest Region.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 189p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002323. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume discerns the information by region. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

893 (DOE/BP/25174–3) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 3, Item-by-item crosstabulations: Volume D, Bonneville Area Offices.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94000975. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume discerns the information by the particular Bonneville Area Office. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

894 (DOE/BP/25174–4) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 4, Item-by-item crosstabulations: Volume E, Pacific Northwest states.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002324. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential

units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume discerns the information by state. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

895 (DOE/BP/25174–5) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 5, Selected crosstabulations: Volume F, Pacific Northwest Region.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002325. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. Selected crosstabulations for the Pacific Northwest Region are recorded. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

896 (DOE/BP/25174–6) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 6, Selected crosstabulations for publicly-owned generating utilities: Volume G, Eastern Washington; Volume H, Western Washington; Volume I, Western Oregon.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94000977. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume is comprised of selected crosstabulations for publicly-owned generating utilities in Eastern Washington, Western Washington, and Western Oregon. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

897 (DOE/BP/25174–7) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 7, Selected crosstabulations for publicly-owned non-generating utilities: Volume J, Western Montana; Volume K, Idaho; Volume L, Eastern Washington; Volume M, Western Washington; Volume N, Eastern Oregon; Volume O, Western Oregon.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 583p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002326. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume is comprised of selected crosstabulations for publicly-owned non-generating utilities in Montana, Idaho, Washington, and Oregon. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

898 (DOE/BP/25174–8) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 8, Selected crosstabulations for investor-owned utilities: Volume P, Western Montana; Volume Q, Idaho; Volume R, Eastern Washington; Volume S, Western Washington; Volume T, Eastern Oregon; Volume U, Western Oregon.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 588p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002327. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume is comprised of selected crosstabulations for investor-owned utilities in Montana, Idaho, Washington, and Oregon. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

899 (DOE/BP/25174–9) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 9, Selected crosstabulations for BPA's Area Offices: Volume V, Puget Sound – Seattle; Volume W, Lower Columbia – Portland; Volume X, Upper Columbia – Spokane; Volume Y, Snake River – Walla Walla.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 394p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002328. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a

special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume contains selected crosstabulations for BPA's area offices in Seattle, Portland, Spokane, and Walla Walla. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

900 (DOE/BP/25174–10) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 10, Selected crosstabulations for states served by Bonneville: Volume Z, Washington; Volume AA, Oregon; Volume AB, Idaho; Volume AC, Western Montana.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 395p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002329. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume contains selected crosstabulations for Washington, Oregon, Idaho, and Montana. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

901 (DOE/BP/25174–11) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 11, Selected crosstabulations for types of Pacific Northwest utilities: Volume AD, Public generating; Volume AE, Public non-generating; Volume AF, Investor-owned.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 295p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002330. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume contains selected crosstabulations for types of Pacific Northwest Utilities to include: public generating, public non-generating, and investor-owned. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

902 (DOE/BP/25174–12) **The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 12, Non-respondent survey: Volume AG, Study of non-respondents.** USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources. Aug 1993. 276p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-92BP25174. Order Number DE94002331. Source: OSTI; NTIS; GPO Dep.

This book constitutes a portion of the primary documentation for the 1992 Pacific Northwest Residential Energy Survey, Phase I. The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications. Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983. This volume contains a follow-up study of non-respondents to the original survey. The information is cross tabulated. "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves.

903 (DOE/CE–0263(03/93)) **Bibliography of the DOE Building Equipment Research Program.** USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Building Equipment Div. Mar 1993. 269p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93017521. Source: OSTI; NTIS; GPO Dep.

This bibliography contains a compilation of reports and technical papers results from research activities sponsored by the Energy Conversion Equipment program. These publications are listed under the following chapter headings: Thermally-Activated Heat Pump, Advanced Refrigeration Systems, Combustion and Thermal Distribution, Lighting Technology, Applicances, Solar Technology, and Cross-cutting Activities. The focus of research efforts for each program element is described in greater detail at the beginning of each respective chapter. Publications within each chapter are organized, in most cases, in chronological order beginning with the most recent report. Source information and an abstract accompany each entry. The bibliography concludes with a list of addresses for obtaining copies of the publications and a subject index.

904 (DOE/CE/23821–T2) **Market analysis, energy savings potential, and future development requirements for Radiance: Final report.** Little (Arthur D.), Inc., Cambridge, MA (United States). Oct 1993. 285p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-90CE23821. Order Number DE94000974. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) Office of Conservation and Renewable Energy (CE), Building Equipment Division has funded the development of a sophisticated computer rendering program called Radiance at Lawrence Berkeley Laboratories (LBL). The project review study included: (1) Surveys of the lighting profession to determine how designers would use an improved, user-friendly Radiance, (2) Elucidation of features, including how Radiance could be used to save energy, which could be incorporated into Radiance to facilitate its more widespread use, (3) Outline of a development plan and determination of what costs the DOE might incur if it were to proceed with the development of an improved version, and (4) Weighing the anticipated development costs against anticipated energy-saving benefits.

905 (ETDE/JP-mf–94714745, pp. 47-54) **Energy saving methods of air-conditioning chiller water supply system.** 1992. 99p. In *Successful cases of energy conservation.* Order Number

DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Since the power consumption of the air-conditioning chiller water supply system consisting of six units of centrifugal chillers occupied 15 % of the total power consumption at the whole plant, improvement was carried out to save the power consumption. First, for effective utilization of the chiller capacity, a cascade control method was employed for changing the set values of both the chiller outlet temperature and the chiller flow simultaneously in compliance with the deviation from the supply temperature criteria. Second, for compensating the chiller capacity, the jacket cooling water temperature was altered. While the design condition of the chiller rated capacity specified 32 centigrade for the jacket cooling water temperature, the pole change of the cooling tower fan was performed to set the control target temperature at 24 centigrade, resulting in the chiller capacity increase by 16 %. Furthermore, the secondary pump group control system was altered so that the number of fixed speed pumps was controlled depending on the supply differential pressure of the variable speed pumps. As a result of these improvement, the annual power saving cost amounted to 21 million yen. 9 figs., 2 tabs.

906 (LBL–34101) **Domestic refrigeration appliances in Poland: Potential for improving energy efficiency.** Meyers, S. (Lawrence Berkeley Lab., CA (United States)); Schipper, L.; Lebot, B. Lawrence Berkeley Lab., CA (United States). Aug 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94000729. Source: OSTI; NTIS; GPO Dep.

This report is based on information collected from the main Polish manufacturer of refrigeration appliances. We describe their production facilities, and show that the energy consumption of their models for domestic sale is substantially higher than the average for similar models made in W. Europe. Lack of data and uncertainty about future production costs in Poland limits our evaluation of the cost-effective potential to increase energy efficiency, but it appears likely that considerable improvement would be economic from a societal perspective. Many design options are likely to have a simple payback of less than five years. We found that the production facilities are in need of substantial modernization in order to produce higher quality and more efficient appliances. We discuss policy options that could help to build a market for more efficient appliances in Poland and thereby encourage investment to produce such equipment.

907 (LBL–34223) **The role of the US Department of Energy in indoor air quality and building ventilation policy development.** Traynor, G.W. (Lawrence Berkeley Lab., CA (United States)); Talbott, J.M.; Moses, D.O. Lawrence Berkeley Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930701–7: 6. international conference on indoor air quality and climate, Helsinki (Finland), 4-8 Jul 1993). Order Number DE94000570. Source: OSTI; NTIS; GPO Dep.

Building ventilation consumes about 5.8 exajoules of energy each year in the US The annual cost of this energy, used for commercial building fans (1.6 exajoules) and the heating and cooling of outside air (4.2 exajoules), is about $US 33 billion per year. Energy conservation measures that reduce heating and cooling season ventilation rates 15 to 35% in commercial and residential buildings can result in a national savings of about 0.6 to 1.5 exajoules ($US 3-8 billion) per year assuming no reduction of commercial building fan energy use. The most significant adverse environmental impact of reduced ventilation and infiltration is the potential degradation of the buildings indoor air quality. Potential benefits to the US from the implementation of sound indoor air quality and building ventilation reduction policies include reduced building-sector energy consumption; reduced indoor, outdoor, and global air pollution; reduced product costs; reduced worker absenteeism; reduced health care costs; reduced litigation; increased worker well-being and productivity; and increased product quality and competitiveness.

908 (LUTVDG-TVBH–3018-1-41) **Settling of attic loose-fill insulation: Development of a laboratory method.** Svennerstedt, B. Lund Univ. (Sweden). Dept of Building Technology. 1992. 42p. Order Number DE94709810. Source: OSTI; NTIS.

Settling of loose-fill thermal insulation is an important long-term material property. Information about settling is needed when establishing design thermal performance and when determining durability of loose-fill materials. The need for a laboratory method for determining settling of loose-fill materials such as attic insulation has become more obvious since the use of this insulation type has grown. A new testing device has been constructed according to the principle that the settling of the loose-fill material shall be determined under the same conditions as in a real attic. The test apparatus consists of a one m^3 box to contain loose-fill materials. The box stands on a framework to simulate an attic structure. Under the framework structure a sound tight box with loudspeakers is mounted. Vibrations are produced by sound waves from the loudspeakers. During the settling test the apparatus is placed in a climatic room, where humidity can be cycled to simulate moisture effects. According to the experiments performed, the method seems to be promising. The results of the laboratory experiments show the same tendencies as the field experiments. In the field there are significant differences in settling of cellulosic and mineral wool materials. These differences are also documented in the laboratory experiments. The shape of the settling curves are similar for both the laboratory and field experiments. 5 refs, 28 figs, 7 tabs.

909 (NYSERDA–93-11) **Attic ventilation and air sealing: A technical review of the issues: Final report.** New York State Energy Research and Development Authority, Albany, NY (United States); New York State Dept. of State, Albany, NY (United States); Synertech Systems Corp., Syracuse, NY (United States). Sep 1993. 48p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223.

This report was commissioned by the New York State Energy Research and Development Authority and the New York State Department of State to review the history and state-of-the-art of attic ventilation and air sealing. It includes a mathematical model that is used to examine the complex relationships between such variables as attic bypass leakage area, outside air temperature, household moisture production, and venting area. The primary recommendation is to reduce heat and moisture flows into the attic by permanently sealing all air leakage paths between the house and attic, especially in climate areas that experience sustained periods of low wintertime temperatures. It concludes that current attic ventilation codes, which omit reference to considerations of climate zones, are of marginal utility to the building or retrofit industry and are in need of revision. Recommendations for further research are included.

910 (PNL–8545-Vol.3) **Griffiss Air Force Base omtegrated respirce assessment: Volume 3, Electric resource assessment.** Armstrong, P.R.; Shankle, S.A.; Elliott, D.B.; Stucky, D.J.; Keller, J.M.; Wahlstrom, R.R.; Dagle, J.E.; Gu, A.Y. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 290p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000634. Source: OSTI; NTIS; GPO Dep.

The US Air Force Air Combat Command (ACC) has tasked the US Department of Energy (DOE) Federal Energy Management Program (FEMP) to identify, evaluate, and assist in acquiring all cost-effective energy projects at Griffiss Air Force Base (AFB). FEMP, with support from the Pacific Northwest Laboratory (PNL), is designing this model program for federal customers served by the Niagara Mohawk Power Company. The program with Griffiss AFB will (1) identify and evaluate all cost-effective electric energy projects; (2) develop a schedule for project acquisition considering project type, size, timing, capital requirements, as well as energy and dollar savings; and (3) secure 100% of the financing required to implement electric energy efficiency projects from Niagara Mohawk and have them procure the necessary contractors to perform detailed audits and install the technologies. This report provides the results of the electric energy resource opportunity (ERO) assessments performed by PNL at one of Niagara Mohawk's primary federal facilities, the ACC Griffiss AFB facility located near Rome,

New York. The results of the analyses of EROs are presented in seven common energy end-use categories. A narrative description of each ERO provides information on the initial cost, energy and dollar savings; impacts on operations and maintenance (O&M); and, when applicable, a discussion of energy supply and demand, energy security, and environmental issues. The evaluation methodology and technical and cost assumptions are also described for each ERO. Summary tables present the operational performance of energy end-use equipment before and after the implementation of each ERO and the results of the life-cycle cost analysis indicating the net present value (NPV) and savings-to-investment ratio (SIR) of each ERO.

911 (PNL–8661) **Impact evaluation of adjustable speed drives installed at Hewlett- Packard Company under the Energy $avings Plan.** Sullivan, G.P.; Daellenbach, K.K.; Spanner, G.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000579. Source: OSTI; NTIS; GPO Dep.

This impact evaluation of adjustable speed drives (ASDS) that were recently installed at Hewlett-Packard Company (HP) was conducted for the Bonneville Power Administration (Bonneville) as part of an evaluation of its Energy savings Plan (E$P) Program. The Program makes acquisition payments to firms that install energy conservation projects in their industrial processes. The objective of this impact evaluation was to assess how much electrical energy is being saved at HP as a result of the E$P and to determine how much the savings cost Bonneville and the region. The impact of the project was evaluated with a combination of engineering analysis, financial analysis, interviews, and submittal reviews (HP's Proposal and Completion Report). The project consisted of installing 24 ASDs on 24 variable air volume system supply- and return-fans at HP's Vancouver, Washington manufacturing facility. A secondary benefit to adding the ASDs was the ability to program in a night-setback feature. This feature was always present in the existing central computer system but was not used because of the lack of ASDs. Based on this impact evaluation, energy savings from this project are expected to be 2,582,900 kilowatt-hours/year (kWh/yr), or 0.30 average megawatts. The project cost $252,068 to install, and HP received payment of $201,654 (1992 dollars) from Bonneville for the acquisition of energy savings. The real levelized cost of these energy savings to Bonneville is 7.0 mills/kwh (in 1992 dollars) over the project's assumed 15-year life, and the real levelized cost to the region is 10.8 mills/kwh in 1992 dollars, not including transmission and distribution effects. This project would not have been implemented without the acquisition payment from Bonneville.

912 (PNL–8763) **Energy savings from energy-efficient showerheads: REMP case study results, proposed evaluation algorithm, and program design implications.** Warwick, W.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001082. Source: OSTI; NTIS; GPO Dep.

The Bonneville Power Administration (Bonneville) has initiated two field studies of water-saving devices, the Regional End-Use Metering Program (REMP) study conducted by the Pacific Northwest Laboratory (PNL) and the Bonneville/Puget Sound Power and Light (Puget Power) water flow study just being implemented. These studies address the same subject using somewhat different approaches. The objectives of these studies is to provide statistically valid estimates of energy savings from energy-efficient showerheads under known field conditions. These results will be used to infer energy savings from Bonneville's appliance efficiency program as part of a program impact evaluation. This report has three purposes. The first is to summarize the results of the REMP field study. The second is to introduce and explain the "energy savings algorithm" proposed for the Bonneville program impact evaluation. This algorithm will use data from both the REMP and Puget Power studies, as well as appropriate field data offered by participating utilities. The third purpose is to present information that may be useful in reviewing the current Bonneville program design and estimating savings from program design alternatives.

913 (PNL–8795) **New residential construction compliance: Evaluation of the Washington State Energy Code program.** Warwick, W.M.; Lee, A.D.; Sandahl, L.J.; Durfee, D.L.; Richman, E.E. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001083. Source: OSTI; NTIS; GPO Dep.

This report describes the Pacific Northwest Laboratory's (PNL's) evaluation of the Washington State Energy Code Program (WSECP). In 1990, the Washington State Legislature passed a residential energy efficiency code to be effective July 1, 1992. Bonneville supported passage and implementation of the code to ensure that new residences in the State of Washington were as energy efficient as economically feasible. The Washington State Energy Office (WSEO) is conducting the WSECP for Bonneville to support code implementation. This support takes several forms, including providing training to code enforcement officials, technical support both in the field and through telephone "hot lines," and computerized tools to review house plans for code compliance. WSEO began implementing the WSECP in 1992, prior to the effective date of the new code. This first phase of the WSECP was the subject of an earlier process evaluation conducted by PNL. From that evaluation PNL found that most new homes being built immediateiy after the code went into effect were "grand-fathered" under the old code. The training program for the new code was in place and sessions were being attended by the jurisdictions but it was too early to determine if the training was effective in improving code compliance and easing the transition to the new energy code. That is the subject of this evaluation.

914 (PNL–8881) **Hanford Site lighting occupancy sensor study.** Richman, E.E.; Dittmer, A.L.; Keller, J.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000905. Source: OSTI; NTIS; GPO Dep.

This study was designed to assess the potential energy savings from the use of lighting occupancy sensor control in the US Department of Energy (DOE) Hanford Site office facilities. The final results of the study provide useful information for assessing cost-effective use of occupancy sensor lighting control. The results also include specific application data for Hanford Site office building spaces that indicate where sensor technology could be applied for cost-effective energy savings.

915 (SIB-TN–30) **The indoor climate in the Swedish housing stock: ELIB report no. 7.** Norlen, U. (ed.) (Swedish Institute for Building Research, Gaevle (Sweden)); Andersson, K. (ed.). National Swedish Inst. for Building Research, Gaevle (Sweden). Apr 1993. 105p. (In Swedish). Order Number DE94709823. Source: OSTI; NTIS.

A nation-wide survey of indoor climate in Swedish residential buildings has been carried out (the ELIB study). Almost 20,000 residents in more than 3,300 single- and multi-family houses have participated in a postal questionnaire survey. Detailed technical inspections on site and indoor climate measurements have also been carried out in a sub-sample consisting of more than 1,100 single- and multi-family houses. The measurements include ventilation rates, indoor temperatures, relative humidity of indoor air, and levels of formaldehyde, volatile organic compounds and radon. The survey gives strong evidence that Sweden is confronted with health problems related to indoor climate which affects many residents. (author) figs., tabs., 77 refs.

3202 Transportation

Refer also to citation(s) 962, 979, 1910, 2105, 2866

916 (ANL/ES/CP–78817) **Determinants of multiple measures of acceleration.** Santini, D.J.; Anderson, J. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308143–2: 1993 Society of Automotive Engineers (SAE) future transportation technology conference, San

Antonio, TX (United States), 9-12 Aug 1993). Order Number DE93019510. Source: OSTI; NTIS; GPO Dep.

Statistical analyses of the acceleration capability of gasoline vehicles have focused on zero to 97 km/h acceleration rates and have concluded that peak power per kilogram is an appropriate single surrogate for acceleration capability. In this paper, statistical methods are used with data for 107 vehicles tested and reported by Consumers Union for 1986–1988 model years to estimate the determinants of contemporary gasoline vehicle acceleration capability under various conditions, adding new variables to the statistical tests reported by others. Like previous studies, this analysis determined that power and weight provide the most information about acceleration capability. Using a model formulation unlike other studies, this study found that engine displacement also provides statistically significant improvements in explanation of 0-48, 0-97, and 48-97 km/h acceleration times. The coefficients of the equations imply that the use of smaller displacement engines, holding peak power constant, diminishes start-up and 0-97 km/h acceleration capability. A separate equation is estimated to illustrate the effects of advanced engine technologies on displacement, controlling for power. This equation is used in conjunction with the acceleration equations to illustrate a method of estimating performance-equivalent engine substitutions when engine technologies change. Transmission type was important for start-up acceleration, with automatic-transmission-equipped vehicles being significantly slower than stick-shift-equipped vehicles. Fuel injection was found to significantly improve start-up acceleration. Variables proxying aerodynamic-drag effects tended to be significant determinants of acceleration in the higher-speed equations, but not for start-up acceleration. Estimated aerodynamic drag effects indicated that drag slows down 0-97, 48-97, and 72-105 km/h acceleration of pickup trucks and sport utility vehicles more than passenger cars and vans.

917 (ANL/ES/CP–80771) **Performance analysis of the combined EDS maglev propulsion, levitation, and guidance system.** He, J.L.; Coffey, H.T.; Rote, D.M. Argonne National Lab., IL (United States). [1993]. 7p. Sponsored by Department of Defense, Washington, DC (United States); Department of Transportation, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931102–1: International conference on speed technology for railway and maglev vehicles, Yokohama (Japan), 22-25 Nov 1993). Order Number DE94001346. Source: OSTI; NTIS; GPO Dep.

An analysis of the Japanese maglev system which uses only one set of coils in the guideway for combined levitation, propulsion, and guidance functions is presented in this paper. This preliminary study, using the dynamic circuit approach, indicates that the system is very promising.

918 (ANL/ET/CP–80643) **Vehicle/guideway interaction and ride comfort in maglev systems.** Cai, Y.; Chen, S.S.; Rote, D.M.; Coffey, H.T. Argonne National Lab., IL (United States). [1993]. 7p. Sponsored by Department of Defense, Washington, DC (United States); Department of Transportation, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931102–2: International conference on speed technology for railway and maglev vehicles, Yokohama (Japan), 22-25 Nov 1993). Order Number DE94001319. Source: OSTI; NTIS; GPO Dep.

The importance of vehicle/guideway dynamics in maglev systems is discussed. The particular interest associated with modeling vehicle guide-way interactions and explaining response characteristics of maglev systems for a multicar, multiload vehicle traversing on a single- or double-span flexible guideway are considered, with an emphasis on vehicle/guideway coupling effects, comparison of concentrated and distributed loads, and ride comfort. Coupled effects of vehicle/guideway interactions over a wide range of vehicle speeds with various vehicle and guideway parameters are investigated, and appropriate critical vehicle speeds or crossing frequencies are identified.

919 (ANL/ET/CP–80666) **Instability of EDS maglev systems.** Cai, Y.; Chen, S.S. Argonne National Lab., IL (United States). [1993]. 21p. Sponsored by Department of Defense, Washington, DC (United States); Department of Transportation, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310167–3: 64. shock and vibration symposium, Ft. Walton Beach, FL (United States), 25-28 Oct 1993). Order Number DE93041186. Source: OSTI; NTIS; GPO Dep.

Instabilities of an EDS maglev suspension system with 3 D.O.F. and 5 D.O.F. vehicles traveling on a double L-shaped set of guideway conductors have been investigated with various experimentally measured magnetical force data incorporated into the theoretical models. Divergence and flutter are obtained from both analytical and numerical solutions for coupled vibration of the 3 D.O.F. maglev vehicle model. Instabilities of five direction motions (heave, slip, rill, pitch and yaw) are observed for the 4 D.O.F. vehicle model. It demonstrates that system parameters, such as, system damping, vehicle geometry and coupling effects among five different motions play very important roles in the occurrence of dynamic instabilities of maglev vehicles.

920 (DOE/FTR–93018763) **Travel to Florence, Italy to attend the 24th International Symposium on automative technology and automation, May 20–24, 1991: Foreign trip report, May 18–26, 1991.** Weissenberger, S. Lawrence Livermore National Lab., CA (United States). 21 Jun 1991. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93018763. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of the trip was to attend the 24th International Symposium on Automative Technology and Automation in Florence from May 20 through May 24, 1991. The Symposium consisted of four individual, parallel conferences: (1) Road Transport Informaties (RTI)/Intelligent Vehicle-Highway Systems (IVHS); (2) Electric/Hybrid Vehicles: An Emerging Global Industry; (3) Mechatronics: Use of Electronics for Product Design, Testing, Engineering and Reliability; and (4) New Materials. I primarily attended the RTI/IVHS Conference (itself formed of two parallel sessions), but I also attended sessions of the Electric/Hybrid Vehicle Conference. I brought back proceedings of conferences (1)-(3). Attendance at various sessions during the week ranged from 50 to more than 200. There were significant contributions from Japan, Great Britain, France, Netherlands, Germany, Sweden, Norway, Spain, Italy, and US. The majority of the presentations were from Japan and Europe. Overall, it was clear that work by these countries if far advanced in many of the subject areas, compared to the US. Their progress clearly reflects substantial government and private investments, and, especially in the case of Japan, some quite successful public/private collaborations.

3203 Industrial and Agricultural Processes

Refer also to citation(s) 125, 164, 211, 521, 522, 523, 526, 537, 538, 556, 813, 873, 905, 1004, 1125, 1451, 1454

921 (AAA-KTF/IVT–92/9) **Neural networks in metal industry: A literature review.** Sillanpaeae, M. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 41p. Order Number DE94709667. Source: OSTI; NTIS.

SULA Research programme.

This report presents a brief discussion on the use of neural networks in metal industry. The objective has been to focus especially on applications of potential practical use, where the technique provides assistance and support for solving actual problems in industrial surroundings. The concept 'metal industry' has been taken in a broad sense of the word. In addition to the conventional metal producing process steps, the study also covers part of the manufacturing stage. i.e., applications in product treatment and tool control in base metals industry. The emphasis of the text has been laid on describing the problem domain. Generally, the theoretical aspects of the network technology have been neglected. In case information on the effectiveness of the network application has been available, some main features have been presented. A clear majority of the applications are based on the feedforward architecture, trained with backpropagation. Especially when working industrial applications are concerned, it is evident that a simple network structure has been pursued. The number of hidden layers is regularly only one, and the total number of nodes is generally very small. Single applications based on other techniques, such as the theory of self organizing maps or the Hopfield model, are also

presented. The steelmaking process forms the frame of this presentation. First, some applications in the field of mineral processing are discussed. These are followed by applications in ironmaking, steelmaking and casting. Product quality represents a group of its own. Finally, a couple of applications in tool control and manufacturing are discussed

922 (AAA-KTF/IVT–93/1) **'TUNDTEMP' - an advisory tool for the continuous steel casting process.** Sillanpaeae, M. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1993. 27p. Order Number DE94709672. Source: OSTI; NTIS.

SULA Research Programme.

This report summarizes the major features of the advisory tool 'TUNDTEMP', developed to act as a decision support in the continuous steel casting process. 'TUNDTEMP' provides a means to predict abnormal phenomena of temperature origin in the casting that may be difficult to foresee in practical situations. The heart of the system is a semi-empirical calculation model that yields an estimate of the evolution of the tundish temperature of the liquid steel on the basis of a few important casting factors. The user interface of the system is to a large extent based on the visual presentation of the simulated results. The system also contains an optional rule based mechanism that provides assistance in the result interpretation and, if wished, linguistically formulates action recommendations. A separate program has been built for the tuning of the calculation model and for maintenance of the system. At the end of the report, the different tuning parameters are listed and their impact on the system output are briefly discussed.

923 (AAA-KTF/IVT–93/3) **Evaluation of a temperature model of the continuous steel casting process.** Sillanpaeae, M. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1993. 51p. Order Number DE94709671. Source: OSTI; NTIS.

SULA Research Programme.

This report summarizes some experiences gathered when using the semi-empirical temperature model that forms the heart of the steel casting advisory system 'TUNDTEMP' in simulating the casting process. The model estimates the evolution of the liquid steel temperature in a tundish of a continuous casting machine through a temperature prediction at a couple of central time instants during the casting process. The results are compared with corresponding actual observations during the castings - measured steel temperatures and recorded casting difficulties and interruptions. Explanations for the possible discrepancies are suggested. Starting from a heuristically chosen set of model parameter values, some developing steps have been tested to reduce the simulation errors. The study concentrates mainly on temperature predictions for single heat castings. At the end of the report, some simulations of sequence castings are also briefly discussed.

924 (ANL/ES/CP–78708) **Plasma-chemical waste treatment of acid gases.** Harkness, J.B.L.; Doctor, R.D.; Daniels, E.J. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930647–9: 86. annual meeting and exhibition of the Air and Waste Management Association (AWMA), Denver, CO (United States), 13-18 Jun 1993). Order Number DE93040821. Source: OSTI; NTIS; GPO Dep.

The research to date has shown that a H_2S waste-treatment process based on plasma-chemical dissociation technology is compatible with refinery and high-carbon-oxide acid-gas streams. The minor amounts of impurities produced in the plasma-chemical reactor should be treatable by an internal catalytic reduction step. Furthermore, the plasma-chemical technology appears to be more efficient and more economical than the current technology. The principal key to achieving high conversions with relatively low energies of dissociation is the concept of the high-velocity, cyclonic-flow pattern in the plasma reaction zone coupled with the recycling of unconverted hydrogen sulfide. Future work will include testing the effects of components that might be carried over to the plasma reactor by "upset" conditions in the amine purification system of a plant and testing the plasma-chemical process on other industrial wastes streams that contain potentially valuable chemical reagents. The strategy for the commercialization of this technology is to form a Cooperative Research and Development Agreement with the Institute of Hydrogen Energy and Plasma Technology of the Russian Scientific Center/Kurchatov Institute and with an American start-up company to develop an "American" version of the process and to build a commercial-scale demonstration unit in the United States. The timetable proposed would involve building a "field test" facility which would test the plasma-chemical reactor and sulfur recovery unit operations on an industrial hydrogen sulfide waste s at a scale large enough to obtain the energy and material balance data required for a final analysis of the commercial potential of this technology. The field test would then be followed by construction of a commercial demonstration unit in two to three years. The commercial demonstration unit would be a fully integrated plant consisting of one commercial-scale module.

925 (ANL/ES/CP–80360) **Recycling galvanized steel: Operating experience and benefits.** Dudek, F.J. (Argonne National Lab., IL (United States)); Daniels, E.J.; Morgan, W.A. Argonne National Lab., IL (United States). [1993]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310158–1: Zinc '93, Hobart (Australia), 10-13 Oct 1993). Order Number DE93018580. Source: OSTI; NTIS; GPO Dep.

In response to the increase in consumption of galvanized steel for automobiles in the last decade and the problems associated with remelting larger quantities of galvanized steel scrap, a process is being developed to separate and recover the steel and zinc from galvanized ferrous scrap. The zinc is dissolved from the scrap in hot caustic using anodic assistance and is recovered electrolytically as dendritic powder. The dezinced ferrous scrap is rinsed and used directly. The process is effective for zinc, lead, and aluminum removal on loose and baled scrap and on all types of galvanized steel. The process has been pilot tested for batch treatment of 900 tonnes of mostly baled scrap. A pilot plant to continuously treat loose scrap, with a design capacity of 48,000 tonnes annually, has been in operation in East Chicago, Indiana since early in 1993. The first 450 t of scrap degalvanized in the pilot plant have residual zinc below 0.01% and sodium dragout below 0.01%. Use of degalvanized steel scrap decreases raw materials, environmental compliance, and opportunity costs to steel- and iron-makers. Availability of clean degalvanized scrap may enable integrated steel producers to recycle furnace dusts to the sinter plant and EAF shops to produce flat products without use of high quality scrap alternatives such as DRI, pig iron, or iron carbide. Recycling the components of galvanized steel scrap saves primary energy, decreases zinc imports, and adds value to the scrap. The quantities of zinc available by the year 2000 from prompt and obsolete automotive scrap win approach 25% of zinc consumed in the major automotive production centers of the world. Zinc recycling from galvanized steel scrap, either before or after scrap melting, will have to be implemented.

926 (DOE/MC/28060–93/C0232) **Land application uses of pressurized fluidized-bed combustion (PFBC) ash.** Beeghly, J.H. (Dravo Lime Co., Pittsburgh, PA (United States)); Dick, W.A.; Wolfe, W. Dravo Lime Co., Pittsburgh, PA (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28060. (CONF-9306148–23: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019875. Source: OSTI; NTIS; GPO Dep.

Dry alkaline flue gas desulfurization by-products (dry lime and limestone FGD scrubber ashes) including the American Electric Power (AEP) Tidd PFBC bed and cyclone ash, are being evaluated for beneficial uses via land application for agriculture, mine reclamation, and soil stabilization in a 5 year study that began December, 1990. A 1989 Battelle Memorial Institute report had recommended that the highest priority in stimulating reuse of FGD by-products was the sponsoring of in-field research of coal combustion products generated from high sulfur midwestern coals to (a) better understand and quantify the leach rate, fate and transport of sulfates and trace metals and (b) demonstrate the level of protection necessary to build public acceptance of land-based reuses (1). The specific objectives of the demonstration project are as follows: To characterize the material generated from dry FGD processes; to demonstrate the utilization of dry FGD by-products as an soil amendment material on agricultural lands and on abandoned and active surface coal mines in Ohio; to demonstrate the

use of dry FGD by-product as an engineering material for soil stabilization; to determine the quantities of dry FGD material than can be utilized in each of these applications; to determine the environmental and economic impact of utilizing the material.

927 (ETDE-IT–93-226) **Cooling and heating energy recovery from natural gas decompression in natural gas distribution system: Turbine expander/cogeneration system feasibility.** Mangili, R. (Azienda Municipale Acquedotti Civici, Bergamo (Italy)); Piemonte, C. 1992. 24p. (In Italian). (CONF-9211224–27: 4. ATIG symposium, Naples (Italy), 25-27 Nov 1992). Order Number DE94716534. Source: OSTI; NTIS (US Sales Only).

This paper presents a technical/economic feasibility study done on a proposed energy recovery/cogeneration scheme to be applied at a natural gas distribution system substation located near Bergamo in northern Italy. This station supplies a residential community with about 77 million cubic meters of gas per year at a flow rate varying from 950 to 22,000 cubic meters per hour with upstream pressure going from 50.0 to 38.7 bars respectively. Downstream pressure is set at 2.5 bars. The energy recovery system is based on the use of a turbine expander to recover, in the form of electric power, the energy made available through gas decompression. The thermal energy required (about 2 MW) for the expander system is to be derived from heat recovery from a cogeneration unit which is also to supply cooling energy to the nearby gas utility's administration building. The feasibility study focuses on a comparative performance analyses of two cogeneration equipment alternatives (one, a set of two endothermic gas fuelled engines, and the other, a gas turbine), and two system operating mode alternatives (one giving priority to electric power generation, and the other, to thermal energy production).

928 (ETDE/JP-mf–94714745, pp. 33-41) **Energy conservation by means of the utilization of industrial waste as fuel.** Toyota Motor Co. Ltd., Aichi (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Although the reduction of industrial wastes is being pushed, the amount of industrial wastes is increasing yearly. The incinerator for such industrial wastes has already exceeded its service limit, and its wearing and aged state has been continuing. Approximately 2 billion yen has been spent for its annual repair. Then, introduction of a total system for energy-saving was determined, and introduction of a cogeneration system by utilizing industrial wastes as fuel was planned. In the plan, a fluidized bed incinerator for industrial wastes was employed. Several problems were solved in order to allow this fluidized bed boiler to reduce ashes from wastes and to stably supply high-potential steam to be used for power generation. Actions were taken to meet restrictions on industrial pollutions, such as NOx, SOx, HCl, soot, and dust. Consequently, energy conservation achieved by this fluidized bed boiler was estimated at 3 billion yen/year, and reduction in unit price for contracted electric power was estimated at 1.2 billion yen/year. 15 figs., 5 tabs.

929 (ETDE/JP-mf–94714745, pp. 55-60) **Energy-saving activities toward exhaust heat recovery unit for sintering machine.** Sumitomo Metal Industries Ltd., Osaka (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

The exhaust heat recovery unit consisted of two boiler systems. The No.1 boiler was to recover super-heated steam on the upper stream side of the sintering machine where gas temperature was high, while the No.2 boiler on the lower stream side. The circulating gas pressure loss at the evaporator of the No.1 boiler system had been increased gradually from two years after the installation, and the coefficient of overall heat transmission had been decreased. As a result of inspection, it was found that the evaporator got clogged with dust. Under this situation, various activities were executed to recover the performance of the boiler system and to realize further superior energy-saving effect compared with the previous one. A new super-heater for No.1 boiler was installed on a horizontal duct, while the conventional super-heater was separated into two and the one was used for the evaporator. The pitches of heat-transfer tubes were extended and the types of fins were remodeled in the super-heater, evaporator, and economizer. As a result of these activities, the circulating gas pressure loss was reduced, the exhaust heat recovery rate was increased by 16 %, and energy-saving up to 750 kW was achieved. 4 figs., 4 tabs.

930 (ETDE/JP-mf–94714745, pp. 69-73) **Energy-saving activities in incinerating wastes.** Mazda Motor Corp., Hiroshima (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Approximately 1500 tons of wastes are incinerated at the waste-treatment center in the plant each month. These wastes, such as refuse produced by the plant (waste paper, rag, waste plastic, chips et al.), sludge produced by sewage treatment process, waste paint, waste fluid or waste oil, had been incinerated at each incinerator according to their types. Since the energy balance of the total wastes was 2120 kcal/kg, it was considered that recovering waste heat would be feasible if all wastes were incinerated using a single incinerator. Thus, a rotary bed air current type incinerator equipped with a waste heat boiler was developed and installed to incinerate mixed wastes, instead of the conventional incinerator system where four incinerators had been used for each type of wastes. Furthermore, some additional equipment was installed, such as two sludge dryers utilizing the exhaust gas heat from the waste heat boiler and a crusher for chips or waste plastics et al. As a result of successful completion of the mixed wastes incineration system, steam recovery up to 2500 tons/month, electric power reduction by 16 % and others were achieved. 2 figs., 3 tabs.

931 (EUR–13570) **Solvent emissions from industrial and private use. Part 3: metal degreasing sector.** Heslinga, D.C. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 53p. Contract B.6611-89-38. Source: OSTI; NTIS (US Sales Only).

The emission of solvents to the air is regarded as one of the main sources contributing to the emission of volatile organic compounds (VOC) in Europe. The Commission of the European Communities intends to reduce the emissions of VOC to the air in specified sectors for which emission reduction plans are to be worked out. This document describes the solvent use and opportunities for minimizing the VOC emissions as a result of surface cleaning and degreasing activities. It includes a description of the industrial sector concerned and its place in European industry. The report presents the main processes and techniques, solvent consumption data and composition, as well as the environmental impact of cleaning activities. Having presented legislation and trends in cleaning, the report discusses a possible strategy for solvent emission reduction and costs of abatement techniques. The report makes recommendations for a directive for VOC emission reduction. (author).

932 (EUR–13920) **Development of a high temperature absorption heat pump for waste heat recovery in industry, and with an output temperature level between 100 deg and 130 deg.** Gramatte, W. (Battelle-Institut e.V., Frankfurt am Main (Germany)); Schwerdt, P.; Ruffert, K.; Ehrhardt, J. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 152p. (In German). Contract EN3E-0035-D (B). Source: OSTI; NTIS (US Sales Only).

The object of this research project was to develop a two-stage high-temperature absorption heat pump with an output temperature level between 100 deg C and 130 deg C. It should be universally applicable for waste heat recovery in industry. The two-stage absorption process uses the working pair lithiumbromide/water. (author). 12 refs., 13 figs., 3 tabs., 5 appendices.

933 (EUR–14229) **Energy optimization of a refrigerating system for fast freezing and storage of food supplies.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 56p. (In Italian, English). Contract EE/573/85/IT. Source: OSTI; NTIS (US Sales Only).

The project concerns the energy optimization of a refrigerating plant for fast freezing and storage of food stocks, by means of a

microprocessor automated system. The system controls the factory's main installations: refrigerating compressors, fans of the refrigerating batteries, water and oil pumps and evaporative towers. It optimizes efficiency and allows to reduce energy costs. The system also performs trend analyses over a wide range of process parameters (ammonia, temperature and pressure, temperature values in the cold room, outside temperature, temperature and pressure of compressor oil, etc.). Fundamentally, the project aims to reduce energy costs; furthermore, it has a number of side targets, i.e.: - to minimize manual operation; - to obtain accurate fault diagnostics and alarm reports; - to provide data on electric energy absorption which will serve to work out the energy account report and the optimization of the electric energy supply contract; - to provide historical data on factory operation. On the whole, the system has proved technically successful: in particular, although energy saving amounted to 6.02% of the previous total energy consumption, which is lower than the expected 18%, nevertheless the system has greatly contributed to reduce manual operation and improve fault diagnostics and alarm report. (author). 2 refs., 3 figs., 6 tabs., 3 photos.

934 (EUR–14362) **Catalytic and low temperature combustion.** Ngendakumana, P. (Sart-Tilman, Liege (Belgium)). Commission of the European Communities, Luxembourg (Luxembourg). 1993. 46p. Contract JOUE-0065-BE. Source: OSTI; NTIS (US Sales Only).

The objective of this report is to point out the different techniques already used or which should be used in the near future in order to handle of different fuels ranging from clean fuels to those with high nitrogen and/or high sulphur contents. Catalytic and low temperature combustion systems are promising techniques to meet the new control legislations. Although there are in current practice many techniques able to reduce pollutant emissions in the flue gas stream, this report deals only with techniques operating within the combustor. After a brief review of NO_x formation mechanisms, three techniques are successively considered: the combustion staging, the catalytic combustion and the fluidized-bed combustion. The current state of the art in west european countries, in the field of catalytic combustion, is then given. Finally, the conclusions which arise from this review and recommendations for future research and development in catalytic combustion are given. (author). 27 refs., figs., tabs., appendix.

935 (EUR–14371) **Absorption heat pumps.** Alefeld, G. (Technische Univ. Muenchen, Garching (Germany). Physikdepartment); Scharfe, J. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 57p. (In German). Contract EN 3E-0032-D. Source: OSTI; NTIS (US Sales Only).

The research work performed within the frame of this contract consisted of several phases, the predesign and choice of cycle, the design of complete absorption cycle, construction of components, assembly of the test plant in the laboratory, the start-up of the test plant, the measurement campaign, technical improvements, and a final evaluation and analysis of data collected during the whole time. The heat pump transformer cycle that was chosen, is perfectly adapted for the heat supply and recovery of distillation processes working at or near the 100 deg C. It is a three stage absorption cycle with two independent working fluid cycles and three solution cycles. The output capacity of the test plant was ≈ 60 kW. The estimated Coefficient of Performance, that is the ratio of heat available for the user e.g. the distillation column versus the heat consumption of the heat pump transformer is 4.2. This value was obtained experimentally as well. The evaluation of the experiments showed also that the newly designed absorbers exhibit good heat transfer coefficients. The transient behaviour of the test plant was also studied in order to obtain the time constants for the reaction of the heat pump transformer upon a sudden change. (author). 78 refs., figs., tabs.

936 (EUR–14391) **Retrofit of PLEM 5 with high-temperature NO_x reduction (HTNR) burners and two-stage combustion.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 36p. Contract CS/284/86/NL. Source: OSTI; NTIS (US Sales Only).

The aim of this project is to prove the potential of primary measures (in this case: low NO_x coal/gas burners combined with two-stage combustion) to achieve maximum NO_x reduction at minimum investment and operating costs. As a result, expensive flue gas de-NOxing can be avoided or substantially reduced in size. (author). 14 figs.

937 (EUR–14422) **Oxidative coupling of methane to C_{2+} hydrocarbons. Basis of catalyst mode of operation and process optimization.** Baerns, M. (Bochum Univ. (Germany)); Mleczko, L.; Zanthoff, H. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 161p. Contract EN3C-023-D(B). Source: OSTI; NTIS (US Sales Only).

The catalytic oxidative coupling of methane (OCM) to higher hydrocarbons (C_{2+}) was investigated with respect to catalyst development, kinetics and mechanism of the reaction and process engineering aspects as well as economics. These studies were supplemented by the design of catalysts for the dehydrogenation of ethane, which is one of the main products of the OCM reaction. (author). 61 refs., figs., tabs.

938 (KCL-RAINA–7) **The use of ceramic gas burner in paper drying: Combustion and paper coating tests - Final report.** Kiiskinen, H. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.); Edelman, K. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1992. 27p. (In Finnish). Order Number DE94709714. Source: OSTI; NTIS.

RAINA Research Programme.

The use of infrared dryers in drying of paper has rapidly increased. Gas fired IR dryers cause lower investment and smaller operational cost than the electric ones. On the other hand, the massive construction of the gas fired IR dryers causes weaker controllability than possible for the electric IR dryers. Ceramic gas burner is intended for combustion of pre-mixed gas-air mixture. The combustion takes place in a thin layer on the surface of the burner. The heat from combustion is transferred to the ceramic material mainly through convection but also through radiation. The heated ceramic surface emits radiation to it's surroundings, according to the radiation properties of the ceramic material. The measurements carried out reveal that the emissivity and the surface temperature of the ceramic burner are very close to the present gas fired IR dryers. The radiative heat efficiency of the present devices is about 36-40 %. The highest recorded radiative heat efficiency of the ceramic burner was 36 %. The controllability of the ceramic burner is better than the present ones: the burner responds to changes in the fuel flow within 1-2 seconds and the control range is broad, about 150-450 kW/m^2. The mechanic strength properties of the ceramic burner are rather poor due to porous and lightweight construction. It is possible to increase the strength e.g. through the use of thicker ceramic fibre but this will decrease the controllability of the burner. The ceramic materials - very likely - will be used in infrared dryers as soon as the mechanical strength problems will be resolved.

939 (KCL-RAINA–8) **The use of pinch-technology for improvement of paper mill energy economy: Final report.** Viinikainen, S. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.); Malinen, H. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1992. 52p. (In Finnish). Order Number DE94709715. Source: OSTI; NTIS.

RAINA Research Programme.

Pinch-technology is a method for analysing and designing the use of heat. It can be best applied to process industry which uses large amounts of heat. Pinch-technology is based on mass and heat balance of the process in concern. All of the process streams are analyzed. The so called hot composite curve consists of all streams, which require cooling and the cold composite curve consists of all the streams, which require heating. With help of these curves all of the heat transfer in the process can be analyzed simultaneously. Optimal targets for energy consumption can be obtained before the design of heat-exchanger network. These targets are based on economical optimization. Pinch-technology can also be used when designing heat and power cogeneration and for optimal placing of heat pumps. Computer programs and graphs are used when designing process with the pinch-technology. The composite curves and energy consumption targets can be easily

composed when using software based pinch-technology. It is convenient to present the topology of heat exchanger network in the early phases of the process design using graphic grid presentation.

940 (KCL-RAINA–9) **Vacuum system and ventilation of the dryer section: Final report.** Soininen, M. (Teollisuusmittaus Oy, Turku (Finland)); Backman, H.E.; Karlsson, M. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 52p. (In Finnish). Order Number DE94709716. Source: OSTI; NTIS.

RAINA Research Programme.

At the wire and the press sections of the paper machine water is removed from the paper web with a vacuum system. The vacuum is mainly generated by liquid ring pumps and turbocompressors. The report will present a method that reduces the electric power needed to run the compressors. Also the adiabatic efficiencies of the compressors are calculated. The exhaust air of the turbocompressors is humid (0.10-0.13 kg_{H2O}/kg_{DA}) and very hot (130-170 deg C) and it can be utilized for indirect heating of water and drying air. According to the calculations, 20-50 per cent of the energy consumed in the compressors can be regained. The method that reduces electric power consumption can only be applied on vacuum systems with turbocompressors. By cooling the suction air before the compressors with heat exchangers from a temperature around 40-30 deg C to a temperature of 20 deg C, electric power consumption can be reduced by up to 20 per cent, depending on the temperature before cooling. The reduction is due to the condensation of the humidity in the suction air and the reduction of mass and air flow volumes to the compressors. Furthermore, the suction air becomes relatively dry (0.020-0.030 kg_{H2O}/kg_{DA}) but is still hot (100-140 deg C) and can be used without additional heating as drying air in the drying section. The pay-off-time of the investment will be about 1.5 to 2.5 years when the savings in electric power and in steam for heating of drying air are taken into consideration. The best profit from de method can be obtained when the system is incorporated at the planning stage of the paper machine.

941 (KCL-RAINA–10) **The development of low consistency refining of chemical pulps: Final report.** Heikkurinen, A.; Jousimaa, T.; Levlin, J.E. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 45p. (In Finnish). Order Number DE94709717. Source: OSTI; NTIS.

RAINA Research Programme.

The aim of the project is to develop the refining of chemical pulp so that the consumption of refining energy is minimised while the paper making potential of the fibres is utilised in the best possible way. The project includes the following parts: the development of analytical methods for characterisation of refining effects on fibres and fines; the effect of refining on different fibre fractions; separate refining of softwood pulp fractions and optimisation of pulp refining for different paper grades (based on material from earlier projects) The results indicate that the existing methods for the characterisation of refining effects are not adequate for instance to show the changes which take place in the long fibre fraction during the refining. The fines fraction appeared to be a very important factor also in regard of the properties of chemical pulps. Separate refining of the fibre fractions did not bring any benefits when compared to 'normal' refining at the same energy consumption (it was not possible to optimise the refining parameters for each fraction during these experiments). Calculations based on earlier results indicate that, considering the overall economy of paper making, it is in many cases even better to increase the consumption of refining energy than to try to minimise it. For example, in the case of reinforcement pulps for wood containing printing papers, a gentle way of refining (low specific edge load) helped to decrease the furnish costs even though the energy consumption increased.

942 (KCL-RAINA–11) **Measurement of paper quality: Final report.** Ritala, R.; Niemi, K.; Valtonen, E. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 39p. (In Finnish). Order Number DE94709718. Source: OSTI; NTIS.

RAINA Research Programme.

Variations in paper quality are the main causes for production losses at paper mills. Variations increase the amount of broke and in worst cases lead through web brakes to increased downtime. In this research methods for characterization of small (< 1 cm) and large (> 1 cm) scale variability have been developed. The large scale methods analyze the cross direction variations. Formation is a well-known measure of small scale variability. However, variability in many functional properties of paper is not determined by formation. In this project an off-line sensor has been developed to measure small-scale gloss variability and a prototype to measure small-scale absorption variations. Furthermore, the applicability of commercial smoothness variability sensors for use in paper analysis have been analyzed. An off-line system to measure and analyze the variability of basis weight, thickness and light transmittance in cross direction was developed. The sensors were designed such that streak-like defects could be detected with high accuracy. A procedure to analyze cross directional variations machine-wide was also developed. This approach allows the effects of headbox, calenders, coating units, sizing units and supercalender on end product variability to be estimated. The primary energy effects of quality control are based on better control of drying with no need for over drying and remoisturing. Unfortunately, these savings are minor when compared with the overall energy consumption in papermaking. The effect on energy efficiency, however, is huge because of decreased amount of broke.

943 (KCL-RAINA–12) **Energy efficient use of infrared dryers in paper industry: Final report.** Ojala, K. (Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Thermal Engineering); Lampinen, M. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 161p. (In Finnish, English). Order Number DE94709719. Source: OSTI; NTIS.

RAINA Research Programme.

The effect of various factors on the efficiency of infrared dryers has been studied by applying models of energy balance. Results of these studies are presented, as well measured emission, reflectivity, and transmissivity spectra of numerous materials and emitters. No fixed values of efficiency exist, but the efficiencies of dryers strongly depend on the size of the dryer, cleanness of the protective glass, relative power, and the thickness and the moisture content of the material to be dried. The efficiencies of the dryers already installed in the mills can be improved by reducing the amount of radiation which escapes the dryer, using external flanges beside the dryers. The amount of cooling air in lamp elements can be reduced, especially in the case where a dryer is not used at the full power. The protective glass in front of the lamps can be cleaned by a half-dry cloth, water and acetone. Using these methods, the drying efficiency of an infrared dryer was improved by approx. 40 %. The amount of cooling air can be further reduced by altering the way the dryer is installed into a machine. The important factors that affect the efficiency of a gas-fired dryer are the radiative efficiency of the emitter and the air coefficient of the fuel gas fair coefficient optimum is (1.05...1.1). The heat mass transfer inside paper have been studied as a related subject. These results can be applied in examining the coating process and the moisture and temperature distribution inside paper or cardboard webs during different types of drying or wetting processes. This report consists of three publications. Further notes on IR drying are to be presented in an academic dissertation. One patent application on IR dryers has been filed. The results are being utilized in a new, industrially oriented project.

944 (KCL-RAINA–13) **Energy and quality optimization of pigment coating drying: Final report.** Eklund, D. (Aabo Akademi, Turku (Finland)). Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 18p. (In Swedish). Order Number DE94709720. Source: OSTI; NTIS.

RAINA Research Programme.

In the report the results of a study on liquid- and particle movements during the blade coating process, included the drying is presented. Applicator roll as well as short dwell application is discussed in order to elucidate the differences in liquid transport between these two processes. It was found, that the gross liquid transport into the paper during the coating process itself is larger for the applicator roll than for short dwell application. It was also shown that a thin filter cake is developed already in the beginning of the coating process and that this filter cake is the dominant restraint for fluid flow. In the process, besides the pressure pulses in the process itself, also the sorption potential of the paper can have a significant influence on the amount of water which is transferred

into paper. During the drying, depending on the main direction of the liquid flow a denser layer can be built up in the interface paper-coating colour or coating colour-air. Negligible movements take place in the coating layer plane. The denser layer will restrict the diffusion of steam through the layer and thus prevent the drying. Therefore, a drying strategy, which gives the lowest temperature of the web at a constant moisture content, should be the most favourable from an economical as well as from a quality standpoint.

945 (KCL-RAINA–14) **The effects of suction on dewatering and structure of a wet web on a papermachine wire section: Final report.** Paulapuro, H. (Helsinki Univ. of Technology, Espoo (Finland). Lab. of Paper Technology); Raeisaenen, K.; Karila, S. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 34p. (In Finnish). Order Number DE94709721. Source: OSTI; NTIS.

RAINA Research Programme.

The aim of the project was to find out the effect of vacuum on drainage and the structure of the paper web on a Fourdrinier wire section. At first the essentials of water removal were studied from literature and the objectives for the experimental apparatus were defined. High vacuum pulsation, scraping of the under side of the wire and dynamically adjustable suction levels were of especial concern. The research carried out with the drainage tester showed airflow to be more predominant in water removal at low grammage whereas at higher grammage the pressure difference over the sheet was prevailing. The border between these two mechanisms is approximately between 80-100 g/m^2. Different types of suction slits and their mutual distances have been found to have a clear effect on the final status of the sheet, and this is also pulp and grammage dependent. The results of the quantitative calculations indicate that the possible reasons for this are different retention levels. The drainage tester which was constructed during the project is suitable also for studying different drainage and retention chemicals. The suction pulse frequency was found to have remarkable effects on the z-directional distribution of fillers and fines and water removal. In order to get similar sheet structure as on a Fourdrinier wire section- with regard to filler and fines distribution - the vacuum pulse frequency should be approximately 80 Hz. The suction profile of the pilot scale Fourdrinier wire section was imitated and this justifies the suitability of the tester for predicting the drainage of different pulp types. In order to improve predictability, more information should be collected about the behaviour of the web under the pulsating vacuum using different pulp types and grammage.

946 (KCP–613-5216) **Metrology process waste assessment: Fluorinert bath temperature calibration Z951-421-1.** Mohr, G.V. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001378. Source: OSTI; NTIS; GPO Dep.

Fluorinert, FC-40 and FC-72, was chosen for this pilot Process Waste Assessment (PWA) because it is the most frequently used chemical in Metrology. Fluorinert has been used since 1986 as a substitute for trichloroethylene. Although it is much safer than trichloroethylene, it still has disadvantages. If Fluorinert is taken above its boiling point it will produce toxic chemicals, creating a health hazard rating of 4. To prevent this occurrence, over-temperature controls are installed on the bath and a fume hood is provided for the vapors. Fluorinert is used in a Rosemount Temperature Bath, CE 64138, as a stirred temperature medium which provides a stable temperature environment to compare readings of a Standard Platinum Resistance Thermometer to readings obtained from thermocouples, thermistors, and other types of thermometers. Fluorinert is used primarily to provide a safe liquid medium that can be varied from −120 to 200°F. When temperature devices are removed from the bath, the excess Fluorinert is removed by wiping with a KayDry. Contaminated KayDrys are disposed of as step can waste.

947 (KTM/E-B–166) **KUITU - Energy-efficient mechanical pulping: Final report on the energy research programme 1988-1992.** Sundholm, J. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 72p. (In Finnish). Project KTM-201/881/87. Order Number DE94709702. Source: OSTI; NTIS.

KUITU Research Programme.

The most important aim of the KUITU programme was to improve the competitiveness of the paper industry and paper machinery manufacturers trough improvements in energy technology. The main aims of the KUITU programme have been achieved. The research and joint development projects conducted have shown how specific energy consumption by present-day mechanical pulping processes can be cut by 10-20 % through process modifications. The electricity-saving potential of several new types of pulping process has also been demonstrated. Thirdly, the theoretical limits for energy saving in mechanical pulping have been studied through a coordination project. The results of the KUITU programme suggest that much of the increase in the energy requirement of mechanical pulping can be avoided. The technology for achieving this in groundwood and TMP processes is also starting to take shape. The necessary measures will, however, require both capital investment and, in many cases, further development work. Although it is difficult to give exact figures for the impact of the KUITU programme's results on energy consumption, the coordination project suggests that applying the results of the KUITU programme projects will cut the growth in total electricity consumption by about 5 percentage points. According to the coordination project, the electricity required for mechanical pulping will grow by 15-20 % over the next 5-6 years. Without the findings of the KUITU programme, this growth would be 20-25 %. This corresponds to an annual saving of 0.3-0.4 TWh of energy, equivalent to FIM 50 - 70 million. Electricity output could be cut by 40-60 MIM.

948 (LUTMDN-TMKT–93-5143) **Energy consumption and its distribution in a standardized excavating cycle for the excavator Aakerman H16D.** Svensson, Sven. Lund Univ. (Sweden). Dept. of Machine Design. 1993. 86p. (In Swedish). Order Number DE94709809. Source: OSTI; NTIS.

Examination paper.

The work cycle of an excavator digging a pit has been analyzed. The power demand is continuously analyzed for the main engine and the hydraulic engines. The cycle is simulated in a Turbo Pascal code which calculates power demand and energies for given cycles.

949 (NEDO-P–9215) **Surveys in Hokkaido on promotion of structuring models to be introduced to convert wastes into energy.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 168p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714900. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

With an objective of converting dairy farming wastes and fisheries wastes into resources to be used as energies, this paper discusses development trends and utilization possibilities thereof based on their utilization characteristics. The Tokachi, Abashiri and Nemuro regions produce more cattle wastes, and regions on the coast of the Sea of Okhotsk produce more hepatopancreas of scallop than other regions. The amount of energy from such wastes is subject to large seasonal variations. Methane gas production through methane fermentation is an effective treatment technology, although it is utilized less effectively in Hokkaido. Important is applying the processes depending on energy demand, supply characteristics and regional features. Taking waste utilization characteristics and regionally uneven distribution of resources into account, conceptions on six model systems that could be introduced were structured. The six systems include two types for fisheries wastes utilization, three types for agricultural and dairy farming wastes, and one type for combined utilization of agricultural and fishery wastes. Important factors to select suitable commercial operation sites and promote the operations are stable quantity assurance of waste resources, energy demand, and stable operation, such as could be available in fishery processing complexes and large dairy farming areas. 44 refs., 66 figs., 29 tabs.

950 (NEDO-P–9220) **Study on possibility of developing energy integration technology.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 154p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number

DE94714903. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Developments of conventional individual technologies were reidentified drastically and collectively to study the possibility of developing them as an energy integration technology. In addition, the theory for energy supplier side alone was eliminated, and the user side theory and considerations on environments and human being were valued more importantly. In its bottom-up approaches, existing technologies are first identified transversely, their existing drawbacks are compensated, and other industrial technologies are introduced freely using the key technology as a nucleus. The present study has taken up diverse utilization of the inexhaustible solar energy and development of new energy storing technologies. In its top-down approaches, a proposition was set beginning with thinking what the ideal type could be for energy systems, and pursuits were made along stratified structures. The user side theory was emphasized to impart organic combined functions within the flows of supply and utilization. Energy conversion, storage, and transportation were assembled into one converged integrated function so that diversified energy supply sources may be dealt with efficiently. Non-thermal utilization of chemical energies remains as a problem yet to be solved. 35 refs., 46 figs., 12 tabs.

951 (SAND–93-0521C) **High quality garbage: A neural network plastic sorter in hardware and software.** Stanton, S.L.; Alam, M.K.; Hebner, G.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9311101–2: GOMAC 93: government microcircuit application conference, New Orleans, LA (United States), 1-4 Nov 1993). Order Number DE93041143. Source: OSTI; NTIS; GPO Dep.

In order to produce pure polymer streams from post-consumer waste plastics, a quick, accurate and relatively inexpensive method of sorting needs to be implemented. This technology has been demonstrated by using near-infrared spectroscopy reflectance data and neural network classification techniques. Backpropagation neural network routines have been developed to run real-time sortings in the lab, using a laboratory-grade spectrometer. In addition, a new reflectance spectrometer has been developed which is fast enough for commercial use. Initial training and test sets taken with the laboratory instrument show that a network is capable of learning 100% when classifying 5 groups of plastic (HDPE and LDPE combined), and up to 100% when classifying 6 groups. Initial data sets from the new instrument have classified plastics into all seven groups with varying degrees of success. One of the initial networks has been implemented in hardware, for high speed computations, and thus rapid classification. Two neural accelerator systems have been evaluated, one based on the Intel 8017ONX chip, and another on the AT&T ANNA chip.

952 (SAND–94-8201) **Salt deposition studies in a supercritical water oxidation reactor.** LaJeunesse, C.A.; Rice, S.F.; Hanush, R.G.; Aiken, J.D. Sandia National Labs., Livermore, CA (United States). Oct 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94001708. Source: OSTI; NTIS; GPO Dep.

Supercritical water oxidation (SCWO), a method for destroying aqueous organic waste, is a relatively new technology discovered about fifteen years ago. SCWO occurs at moderate temperatures and pressures where the ability of water to dissolve hydrocarbons and other organic chemicals is greatly enhanced. Depending on the feed stream and residence time, the dissolved organic waste reacts with an oxidizer to produce innocuous combustion products. However, oxidation of organic material containing heteroatoms, such as sulfur or phosphorous, forms sulfuric or phosphoric acid in the absence of metal ions. In situ neutralization with sodium hydroxide then forms salts that are insoluble at supercritical conditions. These salts deposit in the reactor affecting the processing of the organic material. To design a system that can accommodate the formation of these salts, it is important to understand the deposition process quantitatively. This paper is an interim report on an experimental program designed to understand the salt deposition phenomena.

953 (UCRL-JC–114976) **Pollution control applications of pulsed power technology.** Penetrante, B.M. Lawrence Livermore National Lab., CA (United States). 16 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930616–33: 9. IEEE pulsed power conference, Albuquerque, NM (United States), 21-23 Jun 1993). Order Number DE93019611. Source: OSTI; NTIS; GPO Dep.

Much of the activity and growth in the field of pulsed power technology has been spawned by government-sponsored research for military applications. During the last two decades significant advances have been made in pulsed power modulators and accelerators. Pollution control systems for large industrial applications could benefit a great deal by exploring the results of this research and development. In this paper I will present the history of how pulsed power technology got involved in pollution control applications. Emphasis will be placed on the application of pulsed power to pollution control in utility and industrial coal-fired power plants. The use of pulsed techniques for improving the efficiency of electrostatic precipitators will first be discussed; then the parallel developments in electron beam and pulsed corona processing for flue gas treatment will be presented. Pulsed power techniques are essential as supporting technologies for these advanced pollution control methods. To illustrate the large scale of these applications, I will discuss the power requirements of these methods.

3206 Municipalities and Community Systems

Refer also to citation(s) 525, 580, 910, 949, 951, 1962

954 (DOE/CE/27504–T3) **Energy optimization of water distribution system.** Public Technology, Inc., Washington, DC (United States). Feb 1993. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90CE27504. Order Number DE94001443. Source: OSTI; NTIS; GPO Dep.

In order to analyze pump operating scenarios for the system with the computer model, information on existing pumping equipment and the distribution system was collected. The information includes the following: component description and design criteria for line booster stations, booster stations with reservoirs, and high lift pumps at the water treatment plants; daily operations data for 1988; annual reports from fiscal year 1987/1988 to fiscal year 1991/1992; and a 1985 calibrated KYPIPE computer model of DWSD's water distribution system which included input data for the maximum hour and average day demands on the system for that year. This information has been used to produce the inventory database of the system and will be used to develop the computer program to analyze the system.

955 (LUTMDN-TMVK–3156) **Parameter identification in a dynamic model of a flow-through water heater.** Wollerstrand, J. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Mar 1993. 45p. (In Swedish). Order Number DE94709792. Source: OSTI; NTIS.

The water heater consists of a fast, self-regulating thermostatic valve and a plate heat exchanger. Modelling and model implementation of the main components of the heater in the Simnon language are described. Parameter identification is based on experimental data, where flows, temperatures and - for the valve model - primary differential pressure vary over broad intervals. The results show that the heat exchanger model works well. The valve model is reasonable for a given differential pressure, but nonlinearities and hysteresis-effects make it difficult to create a general valve model from the experimental data given. In spite of these imperfections, relatively good agreement between simulations and measurements is achieved. Suggestions are given for new laboratory experiments. 19 refs, 33 figs, 3 tabs.

956 (LUTMDN-TMVK–3158) **Temperature variations in DH networks: Study performed with respect to networks in Denmark, Finland, Germany, the Netherlands and Sweden.** Andersson, Sture; Mattsson, L.; Penderos, M. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Mar 1993. 120p. Order Number DE94709793. Source: OSTI; NTIS.

In directly buried networks for district heating, the forces that result from temperature variations - operational or at special events - have great influence on the life length of the networks. An

important question with respect to mechanical designs is the interpretation of recorded variations of temperature into a basis for this design. In this study, statistics and estimations from a great number of networks in five countries have been collected and investigated. In addition to this, recordings from four networks have been used for calculation of the equivalent number of full cycles with the so called Rain flow cycle count method. Our conclusion is that, under normal circumstances, the equivalent number of full cycles of the range of 100-120 deg C may be described as "less than 10 due to operational variations" "less than 100 due to special events" over a period of 30 years. The actual drop of temperature that a part of a network is subjected to when taken out of operation because of repair work seems to vary considerably from one company to the other.

957 (NREL/TP–430-5692) **Integrated solid waste management in Japan.** National Renewable Energy Lab., Golden, CO (United States); CSI Resource Systems, Inc., Boston, MA (United States). Oct 1993. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018225. Source: OSTI; NTIS; GPO Dep.

The Japanese, through a combination of public policy, private market conditions, a geographic necessity, practice integrated municipal solid waste (MSW) management. The approach of MSW management in Japan is as follows: The basic concept of refuse treatment consists of recycling discharged refuse into usable resources, reusing such resources as much as possible, and then treating or disposing of the usable portion into a sanitary condition. Considering the difficulty of procuring land or seaside areas for such purpose as a refuse disposal site, it will be necessary to minimize the volume of refuse collected for treatment or disposal.

958 (NREL/TP–430-5700) **Field evaluation of natural gas and dry sorbent injection for MWC emissions control.** Wohadlo, S. (Institute of Gas Technology, Chicago, IL (United States)); Abbasi, H.; Cygan, D. National Renewable Energy Lab., Golden, CO (United States); Institute of Gas Technology, Chicago, IL (United States). Oct 1993. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018227. Source: OSTI; NTIS; GPO Dep.

The Institute of Gas Technology (IGT), in cooperation with the Olmsted Waste-to-Energy Facility (OWEF) and with subcontracted engineering services from the Energy and Environmental Research Corporation (EER), has completed the detailed engineering and preparation of construction specifications for an Emissions Reduction Testing System (ERTS). The ERTS has been designed for retrofit to one of two 100-ton/day municipal waste combustors at the OWEF, located in Rochester, Minnesota. The purpose of the retrofit is to conduct a field evaluation of a combined natural gas and sorbent injection process (IGT's METHANE de-TOX^{SM}, IGT Patent No. 5,105,747) for reducing the emissions of oxides of nitrogen (NO_x), hydrochloric acid (HCl), oxides of sulfur (SO_x), carbon monoxide (CO), total hydrocarbons (THC), and chlorinated hydrocarbons (dioxin/furans). In addition, the design includes modifications for the control of heavy metals (HM). Development of the process should allow the waste-to-energy industry to meet the Federal New Source Performance Standards for these pollutants at significantly lower costs when compared to existing technology of Thermal deNO_x combined with spray dryer scrubber/fabric filters. Additionally, the process should reduce boiler corrosion and increase both the thermal and power production efficiency of the facility.

959 (NYSERDA–93-12) **Reduced gas pressure operation of sludge digesters: Expanded studies: Final report.** New York State Energy Research and Development Authority, Albany, NY (United States); Niagara Mohawk Power Corp., Syracuse, NY (United States); Syracuse Univ., NY (United States). Dept. of Civil and Environmental Engineering. Sep 1993. 108p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223.

Previous investigations strongly suggested that the municipal anaerobic sludge digestion process could be enhanced by reactor operation with subatmospheric headspace pressures. Enhanced solids destruction and methane production along with increased process stability were observed in these earlier studies. However, due to the small scale of the anaerobic reactors used (≈1.5 L), definitive steady-state measurements could not be obtained. These expanded studies were undertaken to verify and define the magnitude of the benefits that might be obtained with vacuum operation of sludge digesters. Four reactors (≈15.0 L) were fed municipal sludge at three different organic loading rates while being maintained with a 15-day solids retention time. One reactor had a constant headspace pressure of 1.02 atm; a second was maintained at 0.75 atm; and the remaining two reactors were operated for the majority of the day at 1.02 atm, and for part of the day with a 0.75 atm headspace pressure. Additional small-scale, batch experiments were performed to help identify controlling digestion mechanisms. The results of these expanded studies indicate that vacuum operation did not yield significant advantages over the organic loading range investigated (0.088 to 0.352 lb VSS/ft^3-d).

960 (PNL–8424-Vol.1) **Fort Drum integrated resource assessment: Volume 1, Executive summary.** Dixon, D.R.; Armstrong, P.R.; Daellenbach, K.K. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000545. Source: OSTI; NTIS; GPO Dep.

Some of the most difficult problems that a federal site has in reducing its energy consumption in a cost-effective manner revolve around understanding where the energy is being used, and what technologies could be employed to decrease the energy use. Many large federal sites have one or two meters to track electric energy use for several thousand buildings and numerous industrial processes. Even where meters are available on individual buildings or family housing units, the meters are not consistently read. When the federal energy manager has been able to identify high energy users, he or she may not have the background, training, or resources to determine the most cost-effective options for reducing this energy use. This can lead to selection of suboptimal projects that prevent the site from achieving the full life-cycle cost savings. The US Department of Energy (DOE) Federal Energy Management Program (FEMP), supported by the Pacific Northwest Laboratory (PNL), has developed a model program that provides a systematic approach to evaluating energy opportunities that (1) identifies the building groups and end uses that use the most energy (not just have the greatest energy-use intensity), and (2) evaluates the numerous options for retrofit or installation of new technology that will result in the selection of the most cost-effective technologies. In essence, this model program provides the federal energy manager with a roadmap to significantly reduce energy use in a planned, rational, cost-effective fashion that is not biased by the constraints of the typical funding sources available to federal sites. The results from this assessment process can easily be turned into a five- to ten-year energy management plan that identifies where to start and how to proceed in order to reach the mandated energy consumption targets.

961 (PNL–8809-Vol.2) **Robins Air Force Base Integrated Resource Assessment: Volume 2, Baseline Detail.** Keller, J.M.; Sullivan, G.P.; Wahlstrom, R.R.; Larson, L.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041254. Source: OSTI; NTIS; GPO Dep.

This report documents the assessment of baseline energy use at Robins Air Force Base (AFB), a US Air Force Materiel Command facility located near Macon, Georgia. This is a companion report to Volume 1, Executive Summary, and Volume 3, Integrated Resource Assessment. The US Air Force Materiel Command (AFMC) has tasked the US Department of Energy (DOE) Federal Energy Management Program (FEMP), supported by the Pacific Northwest Laboratory (PNL), to identify, evaluate, and assist in acquiring all cost-effective energy projects at Robins AFB. This is part of a model program that PNL is designing to support energy-use decisions in the federal sector. This program (1) identifies and evaluates all cost-effective energy projects; (2) develops a schedule at each installation for project acquisition considering project

type, size, timing, and capital requirements, as well as energy and dollar savings; and (3) targets 100% of the financing required to implement energy efficiency projects. PNL applied this model program to Robins AFB. The analysis examines the characteristics of electric, natural gas, oil, propane, and wood chip use for fiscal year 1991. The results include energy-use intensities for the facilities at Robins AFB by building type, fuel type, and energy end use. A complete energy consumption reconciliation is presented that accounts for the distribution of all major energy uses and losses among buildings, utilities, and central systems.

962 (VTT-SYMP–112) **Energy conservation in urban planning.** Lahti, P. (ed.) (Technical Research Centre of Finland, Espoo (Finland). Lab. of Urban Planning and Building Design). Technical Research Centre of Finland, Espoo (Finland). 1990. 118p. (CONF-8903284–: 2. Symposium on energy conservation in urban planning, Moscow (Russian Federation), 14-15 Mar 1989). Order Number DE94709701. Source: OSTI; NTIS.

The research project 'Energy Conservation in Urban Planning' belongs to the scientific-technical cooperation programme between Finland and Soviet Union. The project is one of the many cooperation subjects within the building construction sector. Ongoing research topic was selected in the beginning of 1980's after the world wide crises in energy sector. The cooperation units are: from the Finnish side the Technical Research Centre of Finland, Laboratory of Urban Planning and Building Design and from the Soviet side The Central Research and Design Institute of Town Planning (TsNIIP Gradostroitelstvo) from Moscow and the equivalent institute (KievNIIP Gradostroitelstvo) from Kiev. This report includes all the papers presented in the Moscow symposium in 1989. Both symposiums proved that the relationships between energy questions and urban planning has been a subject of relatively constant interest in research field, in spite of the fact that the popularity of the energy questions in general has decreased since the 'energy crises' of 1970's. During the project an experimental evaluation model has been under development in Technical Research Centre of Finland, Laboratory of Urban Planning and Building Design. The model is designed for urban planners to estimate the energy consumption caused by different planning, land use or design solutions. The prototype of this model is now being implemented in real urban planning project in Helsinki city.

3209 Education and Public Relations

963 (NREL/TP–430-5694) **Waste-to-energy in the United States: Socioeconomic factors and the decision-making process.** Curlee, T.R. (Oak Ridge National Lab., TN (United States)); Schexnayder, S.M.; Vogt, D.P.; Wolfe, A.K.; Kelsay, M.P.; Feldman, D.L. National Renewable Energy Lab., Golden, CO (United States). Oct 1993. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018226. Source: OSTI; NTIS; GPO Dep.

Municipal solid waste (MSW) combustion with energy recovery, commonly called waste-to-energy (WTE), was adopted by many US communities during the 1980s to manage their growing quantities of MSW. Although less than one percent of all US MSW was burned to retrieve its heat energy in 1970, WTE grew to account for 16 percent of MSW in 1990, and many experts forecasted that would be used to manage as much as half of all garbage by the turn of the century. However, the growth of WTE has been reduced in recent years by project cancellations. This study takes an in-depth look at the socioeconomic factors that have played a role in the decisions of communities that have considered WTE as a component of their solid waste management strategies. More specifically, a three-pronged approach is adopted to investigate (1) the relationships between a municipality's decision to consider and accept/reject WTE and key socioeconomic parameters, (2) the potential impacts of recent changes in financial markets on the viability of WTE, and (3) the WTE decision-making process and the socioeconomic parameters that are most important in the municipality's decision. The first two objectives are met by the collection and analysis of aggregate data on all US WTE initiatives during the 1982 to 1990 time frame. The latter objective is met by way of four in-depth case studies-two directed at communities that have accepted WTE and two that have cancelled WTE projects.

33 ADVANCED PROPULSION SYSTEMS

Refer also to citation(s) 879

3301 Internal Combustion Engines

Refer also to citation(s) 55, 117, 648, 653, 975, 976

964 (ANL/ESD/TM–53) **Experimental evaluation of oxygen-enriched air and emulsified fuels in a six-cylinder diesel engine.** Sekar, R.R. (Argonne National Lab., IL (United States). Energy Systems Div.); Marr, W.W.; Cole, R.L.; Marciniak, T.J.; Longman, D.E. Argonne National Lab., IL (United States). Energy Systems Div. Jan 1993. 356p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000907. Source: OSTI; NTIS; GPO Dep.

The objectives of this investigation are to (1) determine the technical feasibility of using oxygen-enriched air to increase the efficiency of and reduce emissions from diesel engines, (2) examine the effects of water-emulsified fuel on the formation of nitrogen oxides in oxygen-enriched combustion, and (3) investigate the use of lower-grade fuels in high-speed diesel engines by emulsifying the fuel with water. These tests, completed on a Caterpillar model 3406B, six-cylinder engine are a scale-up from previous, single-cylinder-engine tests. The engine was tested with (1) intake-air oxygen levels up to 30%, (2) water content up to 20% of the fuel, (3) three fuel-injection timings, and (4) three fuel-flow rates (power levels). The Taguchi technique for experimental design was used to minimize the number of experimental points in the test matrix. Four separate test matrices were run to cover two different fuel-flow-rate strategies and two different fuels (No. 2 diesel and No. 6 diesel). A liquid-oxygen tank located outside the test cell supplied the oxygen for the tests. The only modification of the engine was installation of a pressure transducer in one cylinder. All tests were run at 1800 rpm, which corresponds to the synchronous speed of a 60-Hz generator. Test results show that oxygen enrichment results in power increases of 50% or more while significantly decreasing the levels of smoke and particulates emitted. The increase in power was accompanied by a small increase in thermal efficiency. Maximum engine power was limited by the test-cell dynamometer capacity and the capacity of the fuel-injection pump. Oxygen enrichment increases nitrogen-oxide emissions significantly. No adverse effects of oxygen enrichment on the turbocharger were observed. The engine operated successfully with No. 6 fuel, but it operated at a lower thermal efficiency and emitted more smoke and particulates than with No. 2 fuel.

965 (DOE/NASA/0335–5) **Advanced Turbine Technology Applications Project (ATTAP): Annual report 1992.** National Aeronautics and Space Administration, Cleveland, OH (United States). Lewis Research Center; Allied-Signal Aerospace Co., Phoenix, AZ (United States). Garrett Auxiliary Power Div. Mar 1993. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-85CE50111. DEN3-335. (NASA/CR–191088;GARRETT–31-8071(05)). Order Number DE93040366. Source: OSTI; NTIS; GPO Dep.

This report summarizes work performed by Garrett Auxiliary Power Division (GAPD), a unit of Allied-Signal Aerospace Company, during calendar year 1992, toward development and demonstration of structural ceramic technology for automotive gas turbine engines. This work was performed for the US Department of Energy (DOE) under National Aeronautics and Space Administration (NASA) Contract DEN3-335, Advanced Turbine Technology Applications Project (ATTAP). GAPD utilized the AGT101 regenerated gas turbine engine developed under the previous DOE/NASA Advanced Gas Turbine (AGT) program as the ATTAP test bed for ceramic engine technology demonstration. ATTAP focussed on improving AGT101 test bed reliability, development of ceramic design methodologies, and improvement of fabrication and materials processing technology by domestic US ceramics fabricators. A series of durability tests was conducted to verify technology advancements. This is the fifth in a series of technical summary reports published annually over the course of the five-year contract.

966 (DOE/NASA–1087-2) **Three-dimensional modeling of diesel engine intake flow, combustion and emissions-II.** Reitz,

R.D.; Rutland, C.J. Wisconsin Univ., Madison, WI (United States). Dept. of Mechanical Engineering. Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-91CE50306. Contract NAG3-1087. (NASA-CR–191189). Order Number DE94001711. Source: OSTI; NTIS; GPO Dep.

A three-dimensional computer code, KIVA, is being modified to include state-of-the-art submodels for diesel engine flow and combustion. Improved and/or new submodels which have already been implemented and previously reported are: Wall heat transfer with unsteadiness and compressibility, laminar-turbulent characteristic time combustion with unburned HC and Zeldo'vich NO_x, and spray/wall impingement with rebounding and sliding drops. Progress on the implementation of improved spray drop drag and drop breakup models, the formulation and testing of a multistep kinetics ignition model and preliminary soot modeling results are described in this report. In addition, the use of a block structured version of KIVA to model the intake flow process is described. A grid generation scheme has been developed for modeling realistic (complex) engine geometries, and computations have been made of intake flow in the ports and combustion chamber of a two-intake-valve engine. The research also involves the use of the code to assess the effects of subprocesses on diesel engine performance. The accuracy of the predictions is being tested by comparisons with engine experiments. To date, comparisons have been made with measured engine cylinder pressure, temperature and heat flux data, and the model results are in good agreement with the experiments. Work is in progress that will allow validation of in-cylinder flow and soot formation predictions. An engine test facility is described that is being used to provide the needed validation data. Test results have been obtained showing the effect of injection rate and split injections on engine performance and emissions.

967 (EUR–13249) **Fibre-reinforced composite engine.** Bowman, T.J. (Ford Motor Company (United Kingdom) Ltd., Essex (United Kingdom)); Cumming, B.S.; Gilmore, P.R. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 132p. Contract RI1B-0115-D(B). Source: OSTI; NTIS (US Sales Only).

A fibre-reinforced plastic (FRP) composite internal combustion engine has been designed, manufactured and tested by a consortium of seven members. They are: Ford (the project leader), DSM, Galvanoform, GKN, The National Engineering Laboratory, Nottingham University and Vetrotex-St Gobain. The aims of the project were threefold: (i) to investigate the advantages of introducing plastics to engines, (ii) to develop FRP materials for stressed components and with the specific application requirements of the automotive industry, (iii) to develop the high volume manufacturing technology for tooling and finished part production of complex and realistic FRP components. Recycling issues and the potential applications to internal moving parts were not within the scope of this project. These important points are the subject of other research programmes. (author). figs., tabs., appendices.

968 (EUR–13499) **Diesel engine design and operation on variable quality fuels.** Katsoulakos, P. (Lloyd's Register, Surrey (United Kingdom)); Banisoleiman, K.; Smith, L.A. Commission of the European Communities, Luxembourg (Luxembourg). 1991. 27p. Contract EN3E-0139/UK. Source: OSTI; NTIS (US Sales Only).

The objectives of the Lloyd's Register consortium fuels project were to develop a comprehensive diesel simulation facility (DEFOS) which could be used to predict the effects of variable fuel quality on engine 'performance'. The objective was largely satisfied from the results of the project which has established one of the most comprehensive fuel databases worldwide. During the three year project duration (Nov 86 to April 89) some forty different fuels have been chemically analyzed and then tested in a number of experimental and production engines. Chemical analysis was undertaken using Nuclear Magnetic Resonance Spectroscopy (NMR), Thermal analysis including Thermogravimetry and Differential Thermal Analysis, Elemental Analysis and Hydrocarbon group Analysis by High Performance Liquid Chromatography. The purpose was to analyze the influence of structure and composition of fuels on their ignition and combustion behaviour. Five different engines (RUSTON, RICARDO ATLAS, SULZER, MAN B and W, FINCANTIERI) were utilised in the test programme which was designed to investigate the interaction between engine design features and fuel characteristics. The test work confirmed that most fuels burn well at high power (BMEP) ratings but less well at light loads. The difference in overall combustion behaviour of the fuels were generally small and were most clearly seen in ignition delay and initial burning rates for the medium speed engines types. It was shown that improvements in the combustion behaviour of fuels could be gained by optimizing air/fuel ratio and injection rates. The exhaust emissions data collected indicate that for the majority of fuels, it is possible to predict relative NOx, and particulate emissions from ignition, combustion and fuel properties. (author). 14 refs., 8 figs., 2 tabs.

969 (LUTMDN-TMVK–3159) **Program package for pressure measurement, heat release calculation, velocity evaluation and correlation: Version 1.0.** Johansson, Bengt. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. 1993. 112p. Order Number DE94709794. Source: OSTI; NTIS.

This report contains listings of the programs used in the authors licentiate report "Correlation between velocity parameters measured with cycle-resolved 2-D LDV and early combustion in a spark ignition engine". In that report there can also be found some explanation of the structure of the program. See report LUTMDN-TMVK–7012.

970 (LUTMDN-TMVK–7012) **Correlation between velocity parameters measured with cycle-resolved 2-D LDV and early combustion in a spark ignition engine.** Johansson, Bengt. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Apr 1993. 86p. Order Number DE94709795. Source: OSTI; NTIS.

The objective of this thesis is to investigate how the velocity at different locations close to the spark plug influence the early combustion at individual cycles in a SI-engine. 2-D cycle-resolved laser doppler velocimetry (LDV) measurements have been done both inside the spark gap and around the spark tip to extract velocity information. The pressure in the cylinder was measured with a piezo-electric transducer connected to an A/D-card in a standard PC. The velocity information was filtered to separate the low frequency from the high frequency part of the flow. The pressure signal was used in a one-zone heat-release model to get different levels of heat released. The results show a significant influence of the high frequency part on the early part of the combustion when the velocity was measured close to the spark plug tip. The influence was less significant when the velocity was measured at some distance from the electrodes for two different combustion chamber geometries, but the decay of correlation was relatively slow. The correlation between the velocity parameters close to the spark plug and the early flame development showed no dependence of the air-fuel ratio and a modest dependence of ignition timing. The correlation was reduced at higher engine speeds when the engine was running lean but was maintained at higher speeds when the engine was run stoichiometric. No significant changes of correlation could be found when the spark plug geometry and side electrode orientation were changed.

3302 External Combustion Engines

971 (UCRL-JC–114643) **Analysis and experiments of a whistler-wave plasma thruster.** Hooper, E.B. (Lawrence Livermore National Lab., CA (United States)); Ferguson, S.W.; Makowski, M.A.; Stallard, B.W.; Power, J.L. Lawrence Livermore National Lab., CA (United States). 6 Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930948–1: 23. international electric propulsion conference, Seattle, WA (United States), 13-16 Sep 1993). Order Number DE94001533. Source: OSTI; NTIS; GPO Dep.

A plasma thruster operating at high specific impulse ($\geq$ 3500 s) has been proposed to be based on electron-cyclotron resonance heating of whistler waves propagating on a plasma column on a magnetic hill. Calculations using a particle-in-cell code demonstrate that the distortion of the electron velocity distribution by the heating significantly reduces the flow of plasma up the field, greatly improving efficiency and reducing material interactions relative to a

thermal plasma. These and other calculations are presented together with initial experiments on the plasma generated in the proposed device. The experiments are conducted in a magnetic field (3.3×10^{-2} T at resonance) and a magnetic mirror ratio of 5. Microwaves (0.915 GHz, <20 kW) are coupled to the plasma with a helical antenna. Vacuum field measurements are in good agreement with prediction. The desired plasma spatial distribution has not yet been achieved.

3303 Electric-Powered Systems

Refer also to citation(s) 917, 918, 1390

972 (DOE/EE–0003) **Electric and Hybrid Vehicles Program: Sixteenth annual report to Congress for fiscal year 1992.** USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Office of Transportation Technologies. Aug 1993. 61p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040664. Source: OSTI; NTIS; GPO Dep.

This report describes the progress achieved in developing electric and hybrid vehicle technologies, beginning with highlights of recent accomplishments in FY 1992. Detailed descriptions are provided of program activities during FY 1992 in the areas of battery, fuel cell, and propulsion system development, and testing and evaluation of new technology in fleet site operations and in laboratories. This Annual Report also contains a status report on incentives and use of foreign components, as well as a list of publications resulting from the DOE program.

3304 Hybrid Systems

Refer also to citation(s) 972

3306 Vehicle Design Factors

973 (ETDE/JP-mf–94714745, pp. 42-46) **Energy-saving activities in air-blowing for press sheet loader.** 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Energy-saving activities have been performed, such as by taking complete corrective actions against air leak as the first step and by improving the air using method with a view toward positive energy-saving as the second step. It was found that the usage of air can be classified into two types, i.e., air used to activate the actuator and air used to apply force to a part by utilizing the blowing power of air. Since it was also found that, out of the two usages, air used for blowing was used wastefully in some cases, energy-saving in air blowing for press sheet loader was investigated. Effect of the improvement than expected was attained by improving the line and by introducing a new equipment. The merit by this improvement for two lines estimated to be 387 thousand yen/month. Furthermore, when each sheet loader was used at all five lines, the merit was estimated to 657 thousand yen/month. 6 figs., 2 tabs.

3307 Emission Control

Refer also to citation(s) 964

974 (KTH-KTR–93-07) **Catalytic abatement of emissions from alcohol-fueled diesel engines.** Pettersson, Lars. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Chemical Technology. 1993. 35p. (In Swedish). Order Number DE94709808. Source: OSTI; NTIS.

This report describes the results from the first part of the work focused on the development of tailor-made exhaust gas catalysts for alcohol-fueled diesel engines. In this phase the work has been concentrated on neat alcohols, primarily ethanol. The objective for this phase has been to improve the understanding of important phenomena at low-temperature catalytic oxidation of alcohols. The report describes the results from a study of eight different model catalysts. Platinum and palladium have been impregnated on four different supports, aluminium oxide, cerium dioxide, silicon dioxide and titanium dioxide. A laboratory-scale equipment for the testing of catalyst samples in synthetic exhaust gas has been designed and constructed. The testing gas is mixed by the use of neat gases and gas mixtures and all the gas flows in the reactor feed are governed by mass flow controllers. The catalyst samples are tested at steady-state conditions at different temperatures in a synthetic gas mixture corresponding to the composition of the exhaust gas from an ethanol-fueled diesel engine at 100% air excess. The experiments are performed at a space velocity of 100,000/h. The results indicate that platinum and palladium are active catalytic materials for ethanol oxidation, but their activities are inhibited by the presence of carbon monoxide and nitric oxide on the catalyst surface. The production of acetaldehyde primarily takes place at low temperatures and it differs between the different combinations of supports and active materials. 3 refs, 22 figs.

975 (UCRL-JC–114852) **Fundamental limitations of non-thermal plasma processing for internal combustion engine NO_x control.** Penetrante, B.M. Lawrence Livermore National Lab., CA (United States). 19 Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308149–1: 4. international symposium on high pressure low temperature plasma chemistry, Bratislava (Slovakia), 29 Aug - 1 sep 1993). Order Number DE93019622. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the physics and chemistry of non-thermal plasma processing for post-combustion NO_x control in internal combustion engines. A comparison of electron beam and electrical discharge processing is made regarding their power consumption, radical production, NO_x removal mechanisms, and by product formation. Can non-thermal deNO_x operate efficiently without additives or catalysts? How much electrical power does it cost to operate? What are the by-products of the process? This paper addresses these fundamental issues based on an analysis of the electron-molecule processes and chemical kinetics.

976 (UCRL-JC–114927) **Economics of electron beam and electrical discharge processing for post-combustion NO_x control in internal combustion engines.** Penetrante, B.M. Lawrence Livermore National Lab., CA (United States). 2 Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308145–1: 6. Strategic Defense Initiative Organization/Office of Naval Research (SDIO/ONR) pulse power meeting, Chicago, IL (United States), 9-11 Aug 1993). Order Number DE93019574. Source: OSTI; NTIS; GPO Dep.

This paper discusses the physics and chemistry of non-thermal plasma processing for post-combustion NO_x control in internal combustion engines. A comparison of electron beam and electrical discharge processing is made regarding their power consumption, radical production, NO_x removal mechanisms, and by-product formation. Pollution control applications present a good opportunity for transferring pulsed power techniques to the commercial sector. However, unless advances are made to drastically reduce the price and power consumption of electron beam sources and pulsed power systems, these plasma techniques will not become commercially competitive with conventional thermal or surface-catalytic methods.

3308 Alternative Fuels

Refer also to citation(s) 138

977 (DOE/EE–0004) **Federal Alternative Fuel Program Light Duty Vehicle Operations: Second annual report to Congress for fiscal year 1992.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Office of Transportation Technologies. Jul 1993. 56p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040663. Source: OSTI; NTIS; GPO Dep.

This annual report to Congress details the second year of the Federal light duty vehicle operations as required by Section 400AA(b)(1)(B) of the Energy Policy and Conservation Act as amended by the Alternative Motor Fuels Act of 1988, Public Law 100-494. In 1992, the Federal alternative fuel vehicle fleet expanded significantly, from the 65 M85 (85 percent methanol and 15

percent unleaded gasoline) vehicles acquired in 1991 to an anticipated total of 3,267 light duty vehicles. Operating data are being collected from slightly over 20 percent, or 666, of these vehicles. The 601 additional vehicles that were added to the data collection program in 1992 include 75 compressed natural gas Dodge full-size (8-passenger) vans, 25 E85 (85 percent denatured ethanol and 15 percent unleaded gasoline) Chevrolet Lumina sedans, 250 M85 Dodge Spirit sedans (planned to begin operation in fiscal year 1993), and 251 compressed natural gas Chevrolet C-20 pickup trucks. Figure ES-1 illustrates the locations where the Federal light duty alternative fuel vehicles that are participating in the data collection program are operating. The primary criteria for placement of vehicles will continue to include air quality attainment status and the availability of an alternative fuel infrastructure to support the vehicles. This report details the second year of the Federal light duty vehicle operations, from October 1991 through September 1992.

978 (DOE/PO–0001) **First interim report of the Federal Fleet Conversion Task Force.** USDOE, Washington, DC (United States). Aug 1993. 183p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040662. Source: OSTI; NTIS; GPO Dep.

The Federal Fleet Conversion Task Force was created by Executive Order 12844, signed by President Clinton on April 21, 1993. In the Order, the President directed that purchases of alternative fueled vehicles by the Federal Government be substantially increased beyond the levels required by current law. The President charged the Task Force with developing recommendations for carrying out the Executive Order, with special emphasis on setting a course that will lead to the widespread use of alternative fueled vehicles by Federal, State, and local government fleets, by private fleets and, ultimately, by individuals. The chief recommendation of the Task Force is the establishment of a Presidential Clean Cities Initiative. To support creation of the Presidential Initiative, the Task Force identified 38 cities and regions, prioritized into three tiers, for concentrating the Initiative's efforts in Fiscal Years 1994 through 1996. This concentration of effort is key to the effectiveness of the Initiative. The 38 cities and regions would receive priority funding for Federal vehicle purchases and for infrastructure development. In addition, the Task Force has made specific recommendations for overcoming numerous regulatory, economic, and technical barriers that have slowed the introduction of alternative fueled vehicles into general use.

979 (ORNL–6771) **A methodology for assessing the market benefits of alternative motor fuels: The Alternative Fuels Trade Model.** Leiby, P.N. Oak Ridge National Lab., TN (United States). Sep 1993. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94000529. Source: OSTI; NTIS; GPO Dep.

This report describes a modeling methodology for examining the prospective economic benefits of displacing motor gasoline use by alternative fuels. The approach is based on the Alternative Fuels Trade Model (AFTM). AFTM development was undertaken by the US Department of Energy (DOE) as part of a longer term study of alternative fuels issues. The AFTM is intended to assist with evaluating how alternative fuels may be promoted effectively, and what the consequences of substantial alternative fuels use might be. Such an evaluation of policies and consequences of an alternative fuels program is being undertaken by DOE as required by Section 502(b) of the Energy Policy Act of 1992. Interest in alternative fuels is based on the prospective economic, environmental and energy security benefits from the substitution of these fuels for conventional transportation fuels. The transportation sector is heavily dependent on oil. Increased oil use implies increased petroleum imports, with much of the increase coming from OPEC countries. Conversely, displacement of gasoline has the potential to reduce US petroleum imports, thereby reducing reliance on OPEC oil and possibly weakening OPEC's ability to extract monopoly profits. The magnitude of US petroleum import reduction, the attendant fuel price changes, and the resulting US benefits, depend upon the nature of oil-gas substitution and the supply and demand behavior of other world regions. The methodology applies an integrated model of fuel market interactions to characterize these effects.

35 ARMS CONTROL

Refer also to citation(s) 441, 477

3501 Policy, Negotiations, and Legislation

Refer also to citation(s) 983

3502 Proliferation

Refer also to citation(s) 713

980 (ANL/OTD-ER/CP–79937) **Incorporation of excess weapons material into the IFR fuel cycle.** Hannum, W.H.; Wade, D.C. Argonne National Lab., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930913–34: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE93040237. Source: OSTI; NTIS; INIS; GPO Dep.

The Integral Fast Reactor (IFR) provides both a diversion resistant closed fuel cycle for commercial power generation and a means of addressing safeguards concerns related to excess nuclear weapons material. Little head-end processing and handling of dismantled warhead materials is required to convert excess weapons plutonium (Pu) to IFR fuel and a modest degree of proliferation protection is available immediately by alloying weapons Pu to an IFR fuel composition. Denaturing similar to that of spent fuel is obtained by short cycle (e.g. 45 day) use in an IFR reactor, by mixing which IFR recycle fuel, or by alloying with other spent fuel constituents. Any of these permanent denaturings could be implemented as soon as an operating IFR and/or an IFR recycle capability of reasonable scale is available. The initial Pu charge generated from weapons excess Pu can then be used as a permanent denatured catalyst, enabling the IFR to efficiently and economically generate power with only a natural or depleted uranium feed. The Pu is thereafter permanently safeguarded until consumed, with essentially none going to a waste repository.

981 (SAIC–93041141) **Military and diplomatic roles and options for managing and responding to the proliferation of ballistic missiles and weapons of mass destruction: Final report: Program on Stability and the Offense/Defense Relationship.** Hallenbeck, R.A.; Gill, J.M.; Murray, B.L. Science Applications International Corp., McLean, VA (United States). 26 May 1993. 63p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); Arms Control and Disarmament Agency, Washington, DC (United States). Order Number DE93041141. Source: OSTI; NTIS; GPO Dep.

The March seminar, "Military and Diplomatic Roles and Options" for managing and responding to proliferation, featured three presentations: the military and diplomatic implications of preemptive force as a counterproliferation option; an in-depth assessment of the threat posed by biological weapons; and, a new proposed US counterproliferation policy.

982 (UCRL-JC–114402) **Nuclear weapons issues in South Asia.** Joeck, N. Lawrence Livermore National Lab., CA (United States). 2 Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9211112–2: Conference on managing nuclear weapons in a changing world, Livermore, CA (United States), 17-18 Nov 1992; CSTS–43-93). Order Number DE93019612. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses how the US can play a productive mediating role in South Asia by engaging India and Pakistan in an international forum to manage nuclear weapons, as Edward Teller advocated. India and Pakistan have developed their nuclear capabilities because they fear their neighbors, not because they want to threaten fear their neighbors, not because they want to threaten the US. The appropriate response for the US, therefore, is diplomatic engagement and negotiations. In addition to the international approach, encouragement and facilitation of regional and bilateral interactions will also be important. Formal arms control agreements have been reached, but less formal confidence-building measures,

and unilateral security pledges may well be combined to form a more secure strategic environment in South Asia than a nuclear armed confrontation across the porous South Asian border.

983 (UCRL-LR–114070-2) **Director's series on proliferation.** Bailey, K.C. (ed.). Lawrence Livermore National Lab., CA (United States). 7 Sep 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000950. Source: OSTI; NTIS; GPO Dep.

Two essays are included in this booklet. Their titles are "The Dynamics of the NPT Extension Decision" and "North Korea's Nuclear Gambit." The first paper discusses the conference to be held in 1995 to review the Nuclear Non-Proliferation Treaty (NPT) which will decide whether the treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. Topics relevant to this discussion are: Arms control issues, the nuclear test ban, the limited test ban treaty, the French nuclear testing moratorium, former Soviet nuclear weapons, Iraq, North Korea, nuclear-weapon-free zones, security, controls on nuclear weapon materials, peaceful uses of nuclear energy, safeguards, politics, and organizational and procedural issues. The second paper examines short, medium, and long term issues entailed in Korea's nuclear proliferation. Topics considered include: Korean unification, North Korean politics, the nuclear issue as leverage, and the Nuclear Non- Proliferation Treaty.

3503 Verification

Refer also to citation(s) 478, 485, 1223, 1840, 1873, 1874, 1875

984 (UCRL-JC–104909) **Using PEOX IML for iteratively re-weighted multiple linear regression with a block-diagonal covariance matrix.** MacQueen, D.H. Lawrence Livermore National Lab., CA (United States). Aug 1990. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-910280–5: 16. annual SAS users group international conference, New Orleans, LA (United States), 17-20 Feb 1991). Order Number DE94000310. Source: OSTI; NTIS; GPO Dep.

We have been using PROC IML to model the magnitude of a seismic event using signals from one to four seismic stations. Geological properties of the earth through which the shock waves travel introduce a correlation between the recorded signals for each event. Thus up to four correlated dependent variables are recorded for each value of the independent variable. We estimate the dependence of the measured seismic signals on the source using weighted linear regression with a block-diagonal covariance matrix in which the blocks are not all the same dimension and the covariances need to be estimated. After several iterations the weights and covariances converge. We can then estimate the magnitude of the source using a weighted average of the seismic signals, in which the weights and the variance of the estimate depend on which subset of the stations recorded the signal. PROC IML is a useful and succinct programming tool for this problem.

36 MATERIALS

985 (ANL/MSD/CP–80905) **Atomic-scale structure of grain boundaries: Correlations to grain boundary properties.** Merkle, K.L.; Buckett, M.I.; Gao, Y.; Rozeveld, S.J.; Vuchic, B.L.; Wolf, D. Argonne National Lab., IL (United States). Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR 91-20000. (CONF-9308122–10: International Union of Materials Research Societies on advanced materials, Tokyo (Japan), 31 Aug - 4 sep 1993). Order Number DE94001289. Source: OSTI; NTIS; INIS; GPO Dep.

It is generally believed that many properties of solid interfaces are ultimately determined by their structure and composition at the atomic level. We report here on work in two areas of grain boundary (GB) research in which structure-property correlations have been investigated recently. HREM observations in connection with computer modeling of GBs in fcc metals have given considerable insight into correlations between GB energy and atomic-scale GB structure. Efforts to understand and possibly control the supercurrent transport behavior across GBs in high-temperature superconductors require the combination of microstructure characterizations with investigations of electric transport properties. In both areas considerable progress is being made and has already lead to important insights concerning interfacial properties.

986 (LA-UR–93-3391) **Developments in materials for high-field magnets.** Sims, J.R. (Los Alamos National Lab., NM (United States)); Hill, M.A.; Walsh, R.P. Los Alamos National Lab., NM (United States). 1993. 4p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–13: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000761. Source: OSTI; NTIS; GPO Dep.

Results of the National High Magnetic Field Laboratory's program of characterization of materials and fabrication techniques used in the construction of high-field pulsed magnets are reported. High-field pulsed magnets require conductors with high mechanical strength (750 MPa or greater YS at 77K) and high electrical conductivity (70% IACS or greater at RT). Electrical insulation and resin systems for vacuum impregnation with high compressive strength (500 MPa at 77K) and moderate thermal conductivity (1kW/mK at 77K) are also required. Developments and future plans for the characterization of new magnet material systems are discussed. Testing result are reported: Mechanical and fatigue testing, electrical conductivity testing and thermal expansion measurements of high strength, high conductivity conductors at cryogenic and room temperature, mechanical testing of a coil support material at cryogenic and room temperature, thermal expansion and thermal conductivity tests of an electrical insulating system at cryogenic temperatures.

3601 Metals and Alloys

Refer also to citation(s) 181, 182, 184, 204, 205, 222, 300, 328, 480, 490, 512, 683, 690, 692, 695, 697, 707, 710, 736, 738, 740, 761, 774, 857, 876, 973, 1105, 1135, 1141, 1156, 1157, 1252, 1301, 1433, 1435, 1436, 1460, 1818, 1862, 1865, 2274, 2512, 2532, 2563, 2614, 2733

987 (ANL/EP/CP–79739) **Neutronics of a D-Li neutron source – an overview.** Gomes, I.C.; Smith, D.L. Argonne National Lab., IL (United States). Sep 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930928–6: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE94001343. Source: OSTI; NTIS; INIS; GPO Dep.

The importance of having a high energy (14 MeV) neutron source for fusion materials testing is widely recognized. The availability of a test volume with easy accessibility, with a radiation environment similar to the one expected for a fusion reactor, and with dimensions large enough to accommodate several small samples or a small blanket mock-up are requirements impossible to meet with the existing reactors and irradiation facilities. A D-Li neutron source meets the above mentioned requirements, and it uses existing technology. This paper describes some relevant topics related to beam target configuration, neutron flux spectrum, and nuclear responses for a D-Li neutron source. The target-beam configuration is analyzed for different beam cross sectional areas and trade-offs between the area of the beam and related quantities such as available volume for testing, peak fluxes, and flux or nuclear responses gradient are presented. The conclusion is that the D-Li neutron source has the necessary characteristics to be a desirable option for International Fusion Materials Irradiation Facility (IFMIF).

988 (ANL/ET/CP–79400) **Powder synthesis, fabrication, and transport properties of long-length Ag clad Bi-2223 conductors.** Iyer, A.N. (Argonne National Lab., IL (United States)); Balachandran, U.; Haldar, P.; Hoehn, J.G. Jr.; Motowidlo, L.R. Argonne National Lab., IL (United States). Oct 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931009–12: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials,

Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE94002376. Source: OSTI; NTIS; GPO Dep.

Prereacted, polyphase powders of Pb-doped Bi-Sr-Ca-Cu-0 (2223) were prepared by the solid-state reaction of appropriate amounts of Bi_2O_3, PbO, $SrCO_3$, $CaCO_3$, and CuO. The calcined powders were characterized by thermal analysis, x-ray diffraction and scanning electron microscopy. The powders were then used to fabricate long lengths of flexible Ag-clad 2223 superconductor tapes, via the powder-in-tube technique. Growth of the 2223 phase in the tapes at each heat-treatment step has been studied. At 4.2 and 27 K improved process conditions yielded transport critical current density (J_c) values greater than 10^5 A/cm^2 at zero field; at 77 K, J_c exceeded 4×10^4 A/cm^2. Long tapes (up to 70 m in length) have been fabricated and cowound into superconducting pancake coils and their transport properties have been characterized at 4.2, 27, 64 and 77 K.

989 (ANL/ET/CP–80756) **Grain-boundary microchemistry and intergranular cracking of irradiated austenitic stainless steel.** Chung, H.M.; Ruther, W.E.; Sanecki, J.E.; Kassner, T.F. Argonne National Lab., IL (United States). Sep 1993. 10p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930825–9: 6. international symposium on environmental degradation of materials in nuclear power systems: water reactors, San Diego, CA (United States), 3-5 Aug 1993). Order Number DE94000466. Source: OSTI; NTIS; INIS; GPO Dep.

Constant-extension-rate tensile tests and grain-boundary analysis by Auger electron spectroscopy were conducted on high- and commercial-purity (HP and CP) Type 304 stainless steel (SS) specimens from irradiated BWR components to identify mechanisms of irradiation-assisted stress corrosion cracking (IASCC). Susceptibility to intergranular fracture could not be correlated with radiation-induced segregation of impurities such as Si, P, C, or S, but a correlation was obtained with grain-boundary Cr concentration, indicating a role for Cr depletion. Grain-boundary chemistry was conducted on BWR neutron absorber tubes fabricated from two similar heats of HP Type 304 SS of virtually identical bulk chemical composition but exhibiting different susceptibility to IASCC after irradiation to $\approx 2 \times 10^{21}$ n/cm^2 (E > 1 MeV). Grain-boundary concentrations of Cr, Ni, Si, P, S, and C of the cracking-resistant and -susceptible HP heats were virtually identical. However, grain boundaries of the cracking-resistant material contained less N and more B and Li. This observation indicates that, besides the deleterious effect of grain-boundary Cr depletion, synergism between grain-boundary segregation of N and B and transmutation to H and Li plays an important role in IASCC.

990 (ANL/ET/CP–80862) **Relationship of microstructure and mechanical properties for V-Cr-Ti alloys.** Loomis, B.A. (Argonne National Lab., IL (United States)); Gazda, J.; Nowicki, L.J.; Smith, D.L.; Danyluk, S. Argonne National Lab., IL (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930928–9: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE94001431. Source: OSTI; NTIS; INIS; GPO Dep.

Relation of composition, number density, and diameter of precipitates in microstructures of unalloyed V and V-Cr-Ti alloys to the yield strength, hardness, creep stress, and ductile-brittle transition temperature (DBTT) for these materials was determined from analytical electron microscopy analyses of precipitates in these materials and from mechanical properties data. Unalloyed V and V-Cr-Ti alloys with $\leq$3 wt. % Ti contained VC and TI(CNO) precipitates that were coherent with the matrix. The most common precipitates in the alloys were $Ti(C_{1-x-y}N_xO_y)$ that were non-coherent with the matrix. The number density of non-coherent precipitates was maximum in V-3Ti and V-5Cr-3Ti alloys, and the average diameter of non-coherent precipitates was minimum in V-(1–3)Ti and V-5Cr-3Ti alloys. The increase of yield strength and hardness of V on alloying with Ti and Cr was shown to be primarily due to coherent precipitate, solute-atom misfit, and shear-modulus difference effects. The creep stress for rupture in 1000 hours was related to the number density of precipitates, whereas the DBTT was related to the volume fraction of precipitates.

991 (ANL/MCT/CP–77517) **Reaction of iron and steel slags with refractories.** Banerjee, S. (Magneco/Metrel, Inc., Addison, IL (United States)); Anderson, M.W.; Singh, J.P.; Poeppel, R.B. Argonne National Lab., IL (United States). Apr 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310174–1: UNITECR 93, Sao Paulo (Brazil), 31 Oct - 3 nov 1993). Order Number DE93041178. Source: OSTI; NTIS; GPO Dep.

Slag corrosion and erosion has been a major wear factor for refractories wear in contact with molten iron and steel. In blast furnace ironmaking, the slag/iron interface plays a more important role than does the slag/refractory interface. On the other hand in steelmaking, the slag in the ladles and tundish predominantly affect refractory wear. This paper presents the results of a detailed microstructural evaluation of (a) slag and slag/iron interactions with $A1_2O_3$-SiC-C refractories for ironmaking in blast furnaces, (b) basic oxygen furnace and ladle slag interactions with alumina spinel refractories for steelmaking, and (c) slag interactions with working refractory lining for continuous casting tundishes. Results will also be presented on refractory wear/failure due to simultaneous corrosion and penetration by the slag.

992 (ANL/MSD/CP–79360) **Photo-induced antiferromagnetic interlayer coupling in Fe superlattices with iron silicide spacers.** Mattson, J.E. (Argonne National Lab., IL (United States)); Fullerton, E.E.; Kumar, S.; Lee, S.R.; Sowers, C.H.; Grimsditch, M.; Bader, S.D.; Parker, F.T. Argonne National Lab., IL (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR-90-10908. (CONF-931133–5: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE94001345. Source: OSTI; NTIS; GPO Dep.

Sputtered Fe/FeSi films possessing antiferromagnetic (AF) interlayer coupling at room temperature develop ferromagnetic remanence when cooled below 100K, but the AF coupling can be restored at low temperature by exposure to visible light of sufficient intensity (>10 mW/mm^2). We attribute these effects to charge carriers in the FeSi spacer layer which, when thermally or photogenerated, are capable of communicating spin information between the Fe layers.

993 (ANL/MSD/CP–79906) **Orientationally independent antiferromagnetic coupling in epitaxial Fe/Cr (211) and (100) superlattices.** Fullerton, E.E.; Conover, M.J.; Mattson, J.E.; Sowers, C.H.; Bader, S.D. Argonne National Lab., IL (United States). Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931133–3: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE94001270. Source: OSTI; NTIS; GPO Dep.

We present structural and magnetic characterization of epitaxial Fe/Cr(211) and Fe/Cr(100) superlattices grown simultaneously on MgO(110) and MgO (100) substrates by magnetron sputtering. The epitaxial orientation of the Fe/Cr(211) superlattice with the MgO(110) substrates is Fe/Cr[011]//MgO[001] and the orientation of Fe/Cr(100) is Fe/Cr[001]//MgO[011]. We find that for both orientations, that the interlayer coupling oscillates in sign with a period of 18Å, and, furthermore, that the strength and phase of the magnetic coupling are also nearly identical for these two orientations.

994 (ANL/MSD/CP–79942) **Generalized melting criterion for beam-induced amorphization.** Lam, N. Q.; Okamoto, Paul R. Argonne National Lab., IL (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309251–1: 8. international conference on surface modification of metals by ion beams, Kanazawa (Japan), 13-17 Sep 1993). Order Number DE94001333. Source: OSTI; NTIS; INIS; GPO Dep.

Recent studies have shown that the mean-square static atomic displacements provide a generic measure of the enthalpy stored in the lattice in the form of chemical and topological disorder, and that the effect of the displacements on the softening of shear elastic constants is identical to that of heating. This finding lends support to a generalized form of the Lindemann phenomenological

melting criterion and leads to a natural interpretion of crystalline-to-amorphous transformations as defect-induced melting of metastable crystals driven beyond a critical state of disorder where the melting temperature falls below the glass-transition temperature. Application of the generalized Lindemann criterion to both the crystalline and amorphous phases indicates that the enthalpies of the two phases become identical when their shear moduli become equal. This thermo-elastic rule provides a basis for predicting the relative susceptibility of compounds to amorphization in terms of their elastic properties as measured by Debye temperatures. The present approach can explain many of the basic findings on beam-induced amorphization of intermetallic compounds as well as amorphous phase formation associated with ion implantation, ion-beam mixing and other solid-state processes.

995 (ANL/MSD/CP–80646) **Photo- and thermal-induced antiferromagnetic interlayer coupling in Fe/(Fe-Si) superlattices.** Mattson, J.E. (Argonne National Lab., IL (United States)); Fullerton, E.E.; Kumar, S.; Lee, S.R.; Sowers, C.H.; Grimsditch, M.; Bader, S.D.; Parker, F.T. Argonne National Lab., IL (United States). Aug 1993. 20p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR-90-10908. (CONF-9308175–1: Latin American workshop on magnetism, Guanujuato (Mexico), 23-28 Aug 1993). Order Number DE93040822. Source: OSTI; NTIS; GPO Dep.

We have grown via sputtering, Fe - iron silicide superlattices that exhibit novel thermal and photomagnetic effects. For ~15 Å nominal thickness of the silicide layer the superlattices are antiferromagnetically (AF) coupled at room temperature. Upon cooling below 100K, they gradually revert to ferromagnetic alignment, but the AF coupling is restored at low temperature by exposure to visible light off sufficient intensity (> 10 mW/mm^2). These effects are due to charge carriers in the silicide spacer layer which, when thermally or photo-generated, are capable of communicating spin information between the Fe layers.

996 (CONF-930809–10) **The Test Reactor Embrittlement Data Base (TR-EDB).** Stallmann, F.W. (140 Sunrise Drive, Knoxville, TN (United States)); Kam, F.B.K.; Wang, J.A. Oak Ridge National Lab., TN (United States); Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Research. [1993]. 10p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. Agreement 188680415B. From 8. ASTM-EURATOM symposium on reactor dosimetry; Vail, CO (United States); 29 Aug - 3 sep 1993. Order Number DE94001123. Source: OSTI; NTIS; INIS; GPO Dep.

The Test Reactor Embrittlement Data Base (TR-EDB) is part of an ongoing program to collect test data from materials irradiations to aid in the research and evaluation of embrittlement prediction models that are used to assure the safety of pressure vessels in power reactors. This program is being funded by the U.S Nuclear Regulatory Commission (NRC) and has resulted in the publication of the Power Reactor Embrittlement Data Base (PR-EDB) whose second version is currently being released. The TR-EDB is a compatible collection of data from experiments in materials test reactors. These data contain information that is not obtainable from surveillance results, especially, about the effects of annealing after irradiation. Other information that is only available from test reactors is the influence of fluence rates and irradiation temperatures on radiation embrittlement. The first version of the TR-EDB will be released in fall of 1993 and contains published results from laboratories in many countries. Data collection will continue and further updates will be published.

997 (CONF-930997–5) **Miniaturized disk-bend testing, nano-indentation and the microstructure of ion-irradiated titanium aluminides.** Petouhoff, N.L. (California Univ., Los Angeles, CA (United States). Dept. of Materials Science and Engineering); Ardell, A.J.; Oliver, W.C.; Lucas, B.N. Oak Ridge National Lab., TN (United States); California Univ., Los Angeles, CA (United States). Dept. of Materials Science and Engineering; Oak Ridge Associated Universities, Inc., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;FG03-86ER45264 ;AC05-76OR00033. From International symposium on structural intermetallics; Champion, PA (United States); 26-30 Sep 1993. Order Number DE93040600. Source: OSTI; NTIS; INIS; GPO Dep.

Effect of ion irradiation on microstructures and mechanical properties of Ti-52Al (TiAl) and Ti-26Al (Ti_3Al) were investigated. The alloys were irradiated with 2 MeV protons and Ar^+ ions at low temperatures (−175 to −135C) to max fluences of 4.5 x 10^{15} Ar^+/cm^2 and 2 x 10^{17} H^+/cm^2. Yield strengths of unirradiated TiAl and the fracture strength of unirradiated Ti_3Al were 367 ± 33 MPa and 536 ± 30 MPa, respectively, in excellent agreement with published data. Yield strength of TiAl and fracture strength of Ti_3Al increased as a result of irradiation. Strengths of both alloys were lowest for the samples irradiated to the highest Ar^+-ion dose, but otherwise there was no correlation of strength with dose. The nanohardness of irradiated specimens generally increased with dose, but influence of dose on Young's modulus was erratic. Plate-shaped defects vacancy in character, and helical dislocations were observed in irradiated TiAl by TEM. The Ar^+-ion irradiation-induced microstructure of Ti_3Al contained defects producing mottled contrast at 1 dpa and black-spot contrast at 5 dpa. Irradiation-induced loss of long-range order was also observed in both alloys. Influence of these microstructural variables on mechanical behavior is discussed.

998 (CONF-930997–6) **Ni_3Al aluminide alloys.** Liu, C.T. Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on structural intermetallics; Champion, PA (United States); 26-30 Sep 1993. Order Number DE94000493. Source: OSTI; NTIS; GPO Dep.

This paper provides a brief review of the recent progress in research and development of Ni_3Al and its alloys. Emphasis has been placed on understanding low ductility and brittle fracture of Ni_3Al alloys at ambient and elevated temperatures. Recent studies have resulted in identifying both intrinsic and extrinsic factors governing the fracture behavior of Ni_3Al alloys. Parallel efforts on alloy design using physical metallurgy principles have led to properties for structural use. Industrial interest in these alloys is high, and examples of industrial involvement in processing and utilization of these alloys are briefly mentioned.

999 (DOE/ER/12130–1) **Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: [Annual report, November 1, 1992–October 30, 1993].** Was, G.S. Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering. 7 Jul 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER12130. Order Number DE94002334. Source: OSTI; NTIS; INIS; GPO Dep.

Progress was made in the following areas: radioinduced segregation (modeling and experiment), deformation of irradiated microstructures, stress corrosion cracking of irradiated microstructures, and development of an apparatus to determine the role of deformation on the radiation microstructure in-situ. Materials used were based on Ni-Cr-Fe and 304L.

1000 (DOE/ER/45337–T5) **Fundamental studies of stress distributions and stress relaxation in oxide scales on high temperature alloys: [Final progress report].** Shores, D.A.; Stout, J.H.; Gerberich, W.W. Minnesota Univ., Minneapolis, MN (United States). Corrosion Research Center. Jun 1993. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER45337. Order Number DE94001444. Source: OSTI; NTIS; GPO Dep.

This report summarizes a three-year study of stresses arising in the oxide scale and underlying metal during high temperature oxidation and of scale cracking. In-situ XRD was developed to measure strains during oxidation over 1000°C on pure metals. Acoustic emission was used to observe scale fracture during isothermal oxidation and cooling, and statistical analysis was used to infer mechanical aspects of cracking. A microscratch technique was used to measure the fracture toughness of scale/metal interface. A theoretical model was evaluated for the development and relaxation of stresses in scale and metal substrate during oxidation.

1001 (DOE/MC/24207–3326) **Prediction of in-bed tube erosion rates in fluidized beds: Topical report, January 1992–June 1992.** Kono, Hisoshi. West Virginia Univ., Morgantown, WV

(United States). Dept. of Chemical Engineering. Oct 1992. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24207. Order Number DE93000262. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to predict the erosion rates of in-bed tubes of specific materials in fluidized beds by using a novel approach that we have recently developed. This technique assesses the erosion rates of in-bed tubes by considering two key factors: the peaks of the transient forces of solid particles and the characteristic erosion properties of tube materials concerned. We developed a simple characterization method to assess the erosion rates of in-bed tubes. With this method, an erosion index considering the surface area, weight loss of in-bed tubes, and the operating time, was used. A systematic study was carried out in a 411 rectangular fluidized bed to study the relationship between erosion rate and maximum transient forces of solid particles in fluidized beds. Three different kinds of metal tubes, with well defined tensile strength (at) and elasticity modulus (E), were used. They are copper, aluminum and stainless steel. By considering the tensile strength and elasticity modulus, together with the peaks of transient forces of solid particles, a characteristic erosion function was introduced. This characteristic function was found to have a good correlation with the erosion rate. Thus, the prediction of in-bed tube erosion rates was achieved, when the peaks of transient forces of solid particles and tube material's characteristic properties are known.

1002 (ENEA-RT-INN–92-14) **Short-term oxidation behaviour of Ti-Al6-V4 alloy in air at temperatures in range 600-700 degrees C.** Frangini, S. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Mignone, A.; Cigna, G. Jan 1993. 24p. (RT/INN–92-14). Order Number DE94716515. Source: OSTI; NTIS (US Sales Only).

The findings of a study on the oxidation behaviour of a commercially pure Ti-Al6-V4 alloy in air between 600 and 700 degrees C are reported, based on the determination of the kinetic curves, oxygen profiles in the metal beneath the scale, and the examination of the morphology and composition of the scales. The oxidation kinetics at short time intervals (up to 300 hours) were consistent with a parabolic model at 610 and 655 degrees C. Differently, at 700 degrees C, an initial parabolic oxidation was followed by an approximately linear rate after nearly 100 hours of oxidation. From measurements of oxygen penetration diffusion constants and the corresponding activation energies were estimated for oxygen diffusion in the alpha-phase. The scaling behaviour was observed to depend on the oxidation temperature. At 610 degrees C the scale appeared composed of just one very thin and adherent layer. However, at the higher temperatures, a lamellar structure began to develop, best evidenced by exfoliation of part of the scale. Finally, X-ray microanalysis across the scales confirmed the trend of the aluminum to pile up near the external interface of each layer, as reported by a number of research workers.

1003 (ETDE/JP-mf–94714745, pp. 4-9) **Energy conservation by taking advantage of operation change performed at the acid picking line in advance.** Nippon Steel Corp., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

Although basic unit can be improved due to the remodelled line, the steam consumption is increased by 30% when the temperature rising method has been changed from the conventional direct temperature rising method with steam jet to the indirect temperature rising with heat exchanger. The capability of pickling is decreased earlier than before, because the line speed is increased and the thickness of steel plate becomes thinner. Consequently, acid must be replaced more frequently, thereby resulting in increased steam consumption. In order to reduce the steam consumption, the operation change has been tried. A cascade line was designed to effectively utilize the existing facilities. In order to stabilize the acid concentration, a pump was used to automatically supply acid and a cascade pump was installed to add acid to cascade. In addition, the decrease of concentration due to water mixing was prevented. Furthermore, the temperature of the added clean water was successfully raised by leading the steam emitted from the dryer. The merit by these countermeasures was estimatat to 4.12 million yen/year. 8 figs.

1004 (ETDE/JP-mf–94714745, pp. 61-68) **Actions taken toward reducing basic unit of fuel used for reheating furnace.** Nippon Kokan K.K., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

HDR (hot direct rolling) process, where the continuously cast slab is directly rolled without reheating process, contributes remarkably to saving energy and improved yield. However, the HDR execution ratio was approximately 87 % in past record, therefore about 13 % of slabs went to rejections. The cause for the HDR rejection due to hot rolling process was 52%. Under such situation, the following actions were taken by employing the idea of loading slabs invertedly and zebra type hot rolling in order to reduce the HDR rejection and to enhance the energy-saving effect: namely, stopping slabs accurately at desired position, ensuring the space required to load the slab invertedly, automation of retreating movement of walking beams, reduction of allocation time of slab data in the computer, and automatic control in timing to extract invertedly loaded slabs. As a result of these actions, the HDR rejection was reduced up to 9.6 % and reduction of fuel consumption amounted to 3.2×10^6 kcal/year. 7 figs., 1 tab.

1005 (ETDE/JP-mf–94714745, pp. 89-95) **Energy-saving operation of air separator by means of adding liquid oxygen/nitrogen.** Energy Conservation Center, Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

At a steel manufacturing plant, oxygen consumption is generally changed remarkably. At this steel plant, an average amount of oxygen consumption is 67 km^3/h, which is less than the generating capacity of 70 km^3/h in 2 oxygen plants. The said consumption, however, is changed in the range of 10 though 85 km^3/h, and so 3 plants had been operated at the risk of loss. For improvement this situation, a method was developed in which liquid oxygen or liquid nitrogen was injected alternately to the air separator rectifying column and liquid nitrogen or liquid oxygen was extracted respectively. By the method, load adjustment function to be applied to even a large cold air separator was realized. The rectifying column has been operated fully during the night-time where electric power is cheaper, while with low-load during the day-time. For example, liquid nitrogen of 16 km^3/h is injected during the night-time and liquid oxygen of 15 km^3/h during the day-time. As a result of this method, the ratio of effective use of gaseous oxygen marks approximately 100 % and the resultant effect including others amounts to 14 billion yen annually. 6 figs., 6 tabs.

1006 (FEI–2247) **Analysis of data by long-time mechanical properties of 08Kh18N10T steel irradiated by neutrons.** Sopov, O.V.; Solov'ev, V.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 7p. (In Russian). Order Number DE94605337. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the experimental data analysis on a radiative variation of durable mechanical properties of the austenite chromonickel steel 08Kh18N10T being a material of the internal strictures in PWRs, have been given. The equations for the calculation of the time up to the damage are recommended, and also the equations of a maximum relative elongation at a durable rupture. 6 refs.

1007 (INIS-mf–13714, pp. 218-224) **State of the art of plasma spray processing.** Herman, H. (New York Univ., NY (United States). Dept. of Metallurgy and Materials Sciences). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In

Proceedings of the 16th symposium on plasma physics and technology. 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A survey is given of the rapidly developing range of material types that can now be processed by plasma spraying. These include ceramic superconductors, high temperature thick barrier coatings, reactive metals, intermetallic compounds, polymers, and a number of composites. New plasma spray guns are also discussed, which operate at much increased power and allow a greatly enhanced material throughput. As a matter of example, the 160 kW Czech Water Stabilized Plasma Gun developed at the Prague Institute of Plasma Physics is described. Another important development reported is the gas stabilized, 'Electromagnetic Coalescence Plasma' gun. Finally a major breakthrough in the plasma spray technology, the environmental spraying, is discussed. (J.U.) 15 refs.

1008 (INIS-mf–13725) **Electrodeposition of bismuth alloys by the controlled potential method.** Lopez Alvarez, F.A. Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Quimica. 1993. 129p. (In Spanish). Order Number DE94605318. Source: OSTI; NTIS (US Sales Only); INIS.

We worked with the electrodeposition of three bismuth alloys, the composition of the first electrolyte was: 0.3 g/l. Bi; 20 g/l. Ni; and the conditions were pH = 5.2 - 5.6; T = 25 Centigrade degrees; current density 0.3 A /dm^2 - 6.6 A /dm^2. Following alloy was between Bi - Pb, composition of the electrolyte was 3.18 g/l. Bi (metallic); 31.81 g/l. Pb ($Pb(NO_3)_2$) pH : 1; T = 20 Centigrade degrees; current density 10.20 A/dm^2 . The third electrolyte was Bi-Cu, its composition was: 20.89 g/l. Bi; (metallic) 63.54 g/l Cu ($Cu(NO_3)_2$) pH : 1.5 - 1.8; T = 25-30 Centigrade degrees; current density 1-2 A/dm^2 . The best results were obtained with the third electrolyte. The purpose of this work was to experiment with different parameters like temperature, pH and the electrolyte concentration to obtain a bismuth alloy. (Author).

1009 (INIS-mf–14150) **Thermal, electrical and mechanical properties during cristallization of the amorphous alloy $Co_{33}Zr_{67}$.** Nicolaus, M.M. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 11 Aug 1992. 215p. (In German). Order Number DE93796949. Source: OSTI; NTIS (US Sales Only); INIS.

COBALT ALLOYS/crystallization; COBALT ALLOYS/phase transformations; COBALT ALLOYS/deformation; ZIRCONIUM ALLOYS/crystallization; ZIRCONIUM ALLOYS/phase transformations; ZIRCONIUM ALLOYS/deformation; CRYSTALLIZATION; DEFORMATION; THERMODYNAMIC PROPERTIES; MECHANICAL PROPERTIES; ELECTRICAL PROPERTIES; AMORPHOUS STATE; EQUILIBRIUM; PHASE DIAGRAMS

1010 (INIS-SU–342/A) **Physics of radiation damages and radiation material science.** AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. 1991. 101p. (In Russian). Order Number DE93620498. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

1011 (IS-M–761) **First principles calculations for analysis martensitic transformations.** Harmon, B.N.; Zhao, G.L.; Ho, K.M.; Chan, C.T.; Ye, Y.Y.; Ding, Y.; Zhang, B.L. Ames Lab., IA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9307142–1: 3. IUMRS international conference, Tokyo (Japan), 31 Jul - 4 aug 1993). Order Number DE94000666. Source: OSTI; NTIS; INIS; GPO Dep.

The change in crystal energy is calculated for atomic displacements corresponding to phonons, elastic shears, and lattice transformations. Anomalies in the phonon dispersion curves of NiAl and NiTi are analyzed and recent calculations for TiPd alloys are presented.

1012 (IS-M–762) **Strength, ultrasonic and metallurgical evaluation of diffusion bonds.** Ojard, G.C.; Buck, O.; Rehbein, D.K. Iowa State Univ. of Science and Technology, Ames, IA (United States). Center for Nondestructive Evaluation. [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931121–24: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94000665. Source: OSTI; NTIS; GPO Dep.

Diffusion bonding allows similar and dissimilar materials to be bonded together in near net shape. However, differentiation of almost perfect diffusion bonds, with little variation in their acoustic response, is of critical importance since relatively significant changes in bond strength may be a consequence. Challenge is to find ultrasonic techniques sensitive enough to detect small imperfections at interface. Diffusion bonds have been produced that show only a slight variation in a single frequency reflection measurement. The total energy, reflected from bond line, can differentiate these diffusion bonds. This evaluation is based on Parseval's theorem which states that energy in time domain is proportional to energy in the frequency domain. This measurement takes advantage of presence of voids in the diffusion bonds as well as of the interdiffusion zone. Cu and Ni were chosen as the materials to be bonded due to the case of microstructural control. Diffusion bonds fabricated of Ti-6Al-4V are also discussed.

1013 (IS-M–765) **Inelastic neutron scattering of γ-iron, and the determination of the elastic constants by lattice dynamics.** Stassis, C. Ames Lab., IA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-930676–57: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94000694. Source: OSTI; NTIS; INIS; GPO Dep.

The physical properties of the various phases of iron have been the subject of numerous of numerous theoretical and experimental investigations. Of particular interest is the appearance of the fcc γ-phase between approximately 1,200 K and 1,670 K. The authors were able to growth in situ single crystals of fcc iron of sufficient size to perform an inelastic neutron scattering study of the lattice dynamics of this phase of iron. The phonon dispersion curves along the [00ξ],[$\xi\xi$0] and [$\xi\xi\xi$] symmetry directions were measured at 1,428 K. A limited number of phonons were also measured at 1,227 K and 1,640 K to assess the temperature dependence of the phonon frequencies. The data collected at 1,428 K were used to evaluate the elastic constants, the phonon density of states and the lattice contribution to the specific heat. The measured dispersion curves of γ-Fe are qualitatively similar to those of Ni (measured at 296 K) and $Ni_{0.3}Fe_{0.7}$ (measured at 296 and 573 K).

1014 (JAERI-M–93-144) **Creep properties with short period excessive loadings on a nickel-base heat-resistant alloy Hastelloy XR.** Tsuji, Hirokazu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nakajima, Hajime; Tanabe, Tatsuhiko; Nakasone, Yuji. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 74p. (In Japanese). Order Number DE94718965. Source: OSTI; NTIS; INIS.

A series of constant load and temperature creep tests and constant temperature creep tests with short period excessive loadings was carried out on a nickel-base heat-resistant alloy Hastelloy XR, which was developed for applications in the High-Temperature Engineering Test Reactor (HTTR), at temperatures ranging from 900 to 1000degC in order to examine the creep behaviors of the alloy under such conditions. The excessive loading levels were the design stress intensity values Sm for Hastelloy XR indicated in the HTTR high-temperature structural design code. Five to six time excessive loadings did not cause significant changes of the minimum creep rate or the time to onset of tertiary creep. About ten time excessive loadings did not cause significant changes of the time to rupture or the rupture elongation. The above-mentioned results suggest that the design stress intensity values Sm for Hastelloy XR have been determined reasonably. (author).

1015 (JAERI-M–93-150) **Examination of weldability of Ni-Cr-W superalloys.** Tsuji, Hirokazu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nakajima, Hajime; Saito, Teiichiro; Takatsu, Tamao. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 93p. (In Japanese). Order Number DE94719014. Source: OSTI; NTIS; INIS.

Research and development have been carried out on the new Ni-Cr-W superalloy as a structural material for process heating

high-temperature gas-cooled reactors with coolant outlet temperatures of around 1000degC, and the optimum chemical composition has already been proposed. For the application of the newly developed Ni-Cr-W superalloy to the structural components, the soundness and the reliability of the structures with weldments must be secured. Hence weldability of Ni-Cr-W superalloys was examined. The results of the present study can be summarized as follows: (1) Susceptibility to cracking in the weldments of Ni-Cr-W superalloys is extremely high. (2) Susceptibility to cracking in the weldments of the alloy containing titanium is lower than that of the alloy free from titanium. (3) Heat treatment conditions affect susceptibility to cracking in the weldments of Ni-Cr-W superalloys significantly. Based on the results obtained, it has been concluded that the alloy with the same chemical composition as that of the base metal cannot be applied as the filler metal for welding of the newly developed Ni-Cr-W superalloy. Basic data on the weldability of Ni-Cr-W superalloys will be accumulated furthermore, and then research and development will be performed with a view to developing a filler metal for welding of the alloy applying the technique of minor alloying element adjustment. (author).

1016 (KAPL–4759) **Benefits of thread rolling process to the stress corrosion cracking and fatigue resistance of high strength fasteners.** Kephart, A.R.; Hayden, S.Z. Knolls Atomic Power Lab., Schenectady, NY (United States). May 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. (CONF-930825–5: 6. international symposium on environmental degradation of materials in nuclear power systems: water reactors, San Diego, CA (United States), 3-5 Aug 1993). Order Number DE93040438. Source: OSTI; NTIS; GPO Dep.

Stress corrosion cracking (SCC) behavior of cut (machined) vice thread rolled Alloy X-750 and Alloy 625 fasteners in a simulated high temperature primary water environment has been evaluated. SCC testing at 360 and 338C included 157 small and 40 large 60° Vee thread studs. Thread rolled fasteners had improved resistance relative to cut fasteners. Tests of fatigue resistance in air at room temperature and both air and primary water at 315C were conducted on smaller studs with both cut and rolled threads. Results showed rolled threads can have significantly improved fatigue lives over those of cut threads in both air and primary water. Fasteners produced by two different thread rolling methods, in-feed (radial) and through-feed (axial), revealed similar SCC initiation test results. Testing of thread rolled fasteners revealed no significant SCC or fatigue growth of rolling induced thread crest laps typical of the thread rolling process. While fatigue resistance differed between the two rolled thread supplier's studs, neither of the suppliers studs showed SCC initiation at exposure times beyond that of cut threads with SCC. In contrast to rolling at room temperature, warm rolled (427C) threads showed no improvement over cut threads in terms of fatigue resistance. The observed improved SCC and fatigue performance of rolled threads is postulated to be due to interactive factors, including beneficial residual stresses in critically stressed thread root region, reduction of plastic strains during loading and formation of favorable microstructure.

1017 (KAPL–4760) **Analysis of Alloy 600 and X-750 stress corrosion cracks.** Thompson, C.D.; Lewis, N.; Krasodomski, H. Knolls Atomic Power Lab., Schenectady, NY (United States). Jun 1993. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. (CONF-9304146–3: Alloy 600 experts meeting, Warrenton, VA (United States), 5-9 Apr 1993). Order Number DE94001578. Source: OSTI; NTIS; GPO Dep.

A few months ago, KAPL evidence supported the view that Primary or Pure Water Stress Corrosion Cracking (PWSCC) of Alloy 600 results from a hydrogen mechanism. Figure 1 shows an Analytical Electron Microscope (AEM) analysis of a stress corrosion crack (SCC) crack in an A600 split tube U-bend specimen exposed to primary water at 338°C (640°F) for 462 days. The features which appear to confirm a hydrogen mechanism are: (1) A very narrow (< 200 Å) crack with a sharp tip, nearly free of deposits. (2) No evidence of severe plastic deformation in the region immediately ahead of the crack tip. (3) A line of small voids preceding the main crack tip, of which the largest is about 5×10^{-6} cm in length. Shen and Shewmon proposed that PWSCC of Alloy 600 occurs due to small microvoids ahead of a main crack tip. The hypothesis is that such voids result from pockets of methane gas formed by the reaction of atomic hydrogen with carbon in the base metal. The voids are about 10×10^{-6} cm diameter, approximately a factor of 2 larger than the largest voids.

1018 (KCP–613-5255) **Evaluation of non-chromium-containing deoxidizers for aluminum.** Kempf, T.L.; Stimetz, C.J. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Aug 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001377. Source: OSTI; NTIS; GPO Dep.

Environmental and regulatory pressures make it necessary to eliminate the use of hexavalent chromium wherever possible. This report discusses the evaluation of non-chromium deoxidizers as replacements for a hexavalent chromium dioxidizer. The current deoxidizer is used as a deoxidizer for anodizing aluminum and chromate conversion coating as well as a cleaner prior to welding. Performance of replacement deoxidizers was evaluated through salt spray testing, surface analysis, optical metallography, radiography and dye-penetrant analysis of welds, and a production simulation.

1019 (LA-UR–93-2686) **Surface modification of Ti_3Al for improved oxidation resistance.** Vaidya, R.U. (Los Alamos National Lab., NM (United States)); Zurek, A.K.; Castro, R.; Sin, Y.W.; Subramanian, K.N. Los Alamos National Lab., NM (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931009–2: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials in conjunction with materials week and the Materials Applications and Services Exposition, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE93018297. Source: OSTI; NTIS; GPO Dep.

Ti_3Al has very attractive properties such as low density and high temperature mechanical strength for elevated temperature structural applications. Its major drawback however, is poor oxidation resistance at temperatures above 600°C. Potential use of Ti_3Al in high temperature applications depends on its protection from excessive oxidation. To this effect, Al_2O_3 and Al_3Ti were selected as coating materials chemically compatible with Ti_3Al. Al_2O_3 acts as a protective layer on the surface of Ti_3Al and is impervious to oxygen diffusion. Al_3Ti is resistant to high temperatures and also protects the Ti_3Al substrate by forming an oxide layer consisting primarily of Al_2O_3. In this study, Al_2O_3 was plasma sprayed onto the surface of Ti_3Al, while the Al_3Ti was applied by laser melting. Effectiveness of the coatings were investigated after 10 hours of cyclic oxidation.

1020 (LA-UR–93-2919) **Magnetism in $CeRu_2Ge_2$ (cerium ruthenium2 germanium2) and $CeRh_2Ge_2$ (cerium rhodium2 germanium2) and its pressure dependence.** Thompson, J.D. (Los Alamos National Lab., NM (United States)); Graf, T.; Uwatoko, Y. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930865–2: International conference on strongly correlated electron systems, La Jolla, CA (United States), 16-19 Aug 1993). Order Number DE93040061. Source: OSTI; NTIS; GPO Dep.

We have studied magnetism in $CeRu_2Ge_2$ and $CeRh_2Ge_2$ through specific heat in zero and applied magnetic fields, dc magnetization, thermal expansion and electrical resistance measurements at pressures to 21 kbar. Both compounds have two transitions; although we argue that the higher one in $CeRu_2Ge_2$ is due to residual stress in the polycrystalline sample. The overall systematics are consistent with those found at ambient pressure in pseudoternaries formed with Si substitution for Ge.

1021 (LA-UR–93-3115) **Microtextural characterization of annealed and deformed copper.** Wright, S.I.; Heidelbach, F. Los Alamos National Lab., NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309231–1: International conference on textures of materials, Clausthal (Germany), 20-24 Sep 1993). Order Number DE93040144. Source: OSTI; NTIS; GPO Dep.

Even though deformation produces material with preferred orientation it appears to randomize the grain boundary texture in copper. It appears that as dislocations move through the material

the resulting lattice rotations serve to break down the twin structure in a stochastic manner. An effort was made to use the automatic BEKP data to search for dislocation cell wall structures. However, no evidence was found for such structure. This may be due, in part, to the resolution of the backscatter electron Kikuchidi diffraction patter technique. Diffraction occurs from an area with mean diameter of approximately 0.5 μm.

1022 (LA-UR–93-3143) **Alloying studies in $U_{1-x}Th_xPd_2Al_3$ ($0 \leq x \leq 1$).** Dalichaouch, Y. (California Univ., San Diego, La Jolla, CA (United States)); Maple, M.B. Los Alamos National Lab., NM (United States); California Univ., San Diego, La Jolla, CA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36 ;FG03-86ER45230. Grant DMR 91-07698. (CONF-9308173–3: International conference on strongly correlated electronic systems, San Diego, CA (United States), 15-19 Aug 1993). Order Number DE94000807. Source: OSTI; NTIS; GPO Dep.

Measurements of temperature and concentration dependences of magnetic susceptibility and electrical resistivity for $U_{1-x}Th_xPd_2Al_3$ are presented. The magnetic susceptibility data scale with the concentration of U ions over large regions of x and T. The electrical resistivity shows a smooth evolution from the Kondo lattice regime to the single ion Kondo behavior as Th concentration x is increased. A lack of saturation in resistivity in the samples with x = 0.8 and 0.6, and a logarithmic divergence in $\chi(T)$ at low temperatures makes the $U_{1-x}Th_xPd_2Al_3$ system a good candidate for a two-channel Kondo effect.

1023 (LA-UR–93-3155) **Temperature dependence of magnetic order in single-crystalline UPdSn.** Robinson, R.A. (Los Alamos National Lab., NM (United States)); Lawson, A.C.; Lynn, J.W.; Nakotte, H. Los Alamos National Lab., NM (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931133–1: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE93040153. Source: OSTI; NTIS; GPO Dep.

The noncollinear hexagonal antiferromagnet UPdSn exhibits two magnetic phase transitions, at 35.5K and 23K. The first transition is from a hexagonal paramagnetic state to a noncollinear antiferromagnetic state with a doubled unit cell (phase 1). The second 23-K transition is to a monoclinic magnetic structure (phase II). Ever since these transitions were discovered, the question has been whether the moments simply rotate at 23K, or whether the y- and z-components of the moment order at 35.5K while the x-component orders out of incipient fluctuations at the lower 23-K transition. While previous powder studies were rather inconclusive on this point, we now present new single-crystal neutron-diffraction results that show the second picture to be correct. In addition we discuss the structural distortions that accompany the change in symmetry and show that there is phase-II type magnetic short range order between 23K and 35.5K.

1024 (LA-UR–93-3216) **Initial operation of a large-scale Plasma Source Ion Implantation experiment.** Wood, B.P.; Henins, I.; Gribble, R.J.; Reass, W.A.; Faehl, R.J.; Nastasi, M.A.; Rej, D.J. Los Alamos National Lab., NM (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308156–2: Workshop on plasma-based ion implantation, Madison, WI (United States), 4-6 Aug 1993). Order Number DE94000805. Source: OSTI; NTIS; GPO Dep.

In Plasma Source Ion Implantation (PSII), a workpiece to be implanted is immersed in a weakly ionized plasma and pulsed to a high negative voltage. Plasma ions are accelerated toward the workpiece and implanted in its surface. Experimental PSII results reported in the literature have been for small workpieces. A large scale PSII experiment has recently been assembled at Los Alamos, in which stainless steel and aluminum workpieces with surface areas over 4 m^2 have been implanted in a 1.5 m-diameter, 4.6 m-length cylindrical vacuum chamber. Initial implants have been performed at 50 kV with 20 μs pulses of 53 A peak current, repeated at 500 Hz, although the pulse modulator will eventually supply 120 kV pulses of 60 A peak current at 2 kHz. A 1,000 W, 13.56 MHz capacitively-coupled source produces nitrogen plasma densities in the 10^{15} m^{-3} range at neutral pressures as low as 0.02 mtorr. A variety of antenna configurations have been tried, with and without axial magnetic fields of up to 60 gauss. Measurements of sheath expansion, modulator voltage and current, and plasma density fill-in following a pulse are presented. The authors consider secondary electron emission, x-ray production, workpiece arcing, implant conformality, and workpiece and chamber heating.

1025 (LA-UR–93-3249) **Theoretical studies of structural phase transitions in actinide metals.** Wills, J.M. (Los Alamos National Lab., NM (United States)); Boring, A.M.; Eriksson, O.; Soederlind, P. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–3: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000796. Source: OSTI; NTIS; GPO Dep.

Accurate full-potential, relativistic, total energy electronic structure calculations have been carried out over a range of volumes for selected rare-earth and actinide elements in crystal structures experimentally observed in these elements. Correct zero temperature crystal structures are obtained, and calculated equilibrium properties are in reasonable agreement with experiment. Results of these calculations suggest that the unusual equilibrium crystal structures occurring in the light actinides are characteristic of narrow band metals in general and that the light actinides will exhibit structural phase transitions to high symmetry structures under compression. A balance between one-electron bandwidths and band fillings and the electrostatic energy of the crystal lattice produces a tendency toward high-symmetry structures at broad bandwidths and low-symmetry structures at narrow bandwidths. Allowing for expansion as well as contraction, simple metals, transition metals and actinides can be "stabilized" in low- and high-symmetry crystal structures.

1026 (LA-UR–93-3304) **Thermochemistry of the actinides.** Kleinschmidt, P.D. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–10: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000895. Source: OSTI; NTIS; GPO Dep.

The measurement of equilibria by Knudsen effusion techniques and the enthalpy of formation of the actinide atoms is briefly discussed. Thermochemical data on the sublimation of the actinide fluorides is used to calculate the enthalpies of formation and entropies of the gaseous species. Estimates are made for enthalpies and entropies of the tetrafluorides and trifluorides for those systems where data is not available. The pressure of important species in the tetrafluoride sublimation processes is calculated based on this thermochemical data.

1027 (LA-UR–93-3350) **Magnetic phases in UNiGe.** Sechovsky, V. (Charles Univ., Prague (Czech Republic). Dept. of Metal Physics); Havela, L.; Purwanto, A. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States); U.S. Czechoslovak Science and Technology Joint Fund (United States); Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague (Netherlands). DOE Contract W-7405-ENG-36. (CONF-930905–11: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000793. Source: OSTI; NTIS; GPO Dep.

Original measurements of 4.2 K magnetization curves and temperature dependence of magnetic susceptibility were completed by an extended study of magnetization, specific heat, and electric resistivity as a function of temperature and magnetic field. Neutron diffraction experiments were also performed on powder and single crystal. The specific heat shows a sharp peak at 41.5 K, corresponding to the first-order phase transition, and a broad anomaly around 50 K. The magnetic structures in UNiGe confirm that the strong bonding of 5f orbitals along the a axis leads to a huge magnetic anisotropy with U magnetic moments perpendicular to this direction.

1028 (LA-UR–93-3449) **Muon spin relaxation studies of the interplay between magnetism and superconductivity in**

heavy fermion systems. Heffner, R.H. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–6: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000700. Source: OSTI; NTIS; INIS; GPO Dep.

The interplay between magnetism and superconductivity in heavy fermion systems is discussed and the role of muon spin relaxation in elucidating these properties is emphasized. Relevant properties of all six heavy fermion superconductors are briefly surveyed and instances where superconductivity and magnetism compete, coexist and couple with one another are pointed out. Current theoretical concepts underlying these phenomena are highlighted.

1029 (LA-UR–93-3453) **The effects of texture and strain on the r-value of heavy gauge tantalum plate.** Michaluk, C. (Cabot Performance Materials, Boyertown, PA (United States)); Bingert, J.; Choi, C.S. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309231–3: International conference on textures of materials, Clausthal (Germany), 20-24 Sep 1993). Order Number DE94000690. Source: OSTI; NTIS; GPO Dep.

Previous work by other researches suggest that the r-values measured from thick-gauge tantalum plate do not correspond to the predicted r-values calculated from ODF coefficients. To understand this behavior, bulk texture analysis using neutron diffraction techniques was conducted on annealed samples of Ta and Ta-2.5W plate: the pure tantalum exhibited a primary {111} type texture whereas the alloy contained a cube texture. For the pure tantalum, the r-values calculated from the texture of as-annealed and the deformed specimens were similar and correlated well with measured data. The r-value of the Ta-2.5W exhibited a greater degree of strain-sensitivity, such that the calculated r-values based on the initial texture did not represent those calculated or measured after tensile deformation. Strain sensitivity of r-values in Ta and Ta-2.5W plates is related to the generation of a $<\bar{1}10>$ fiber texture during deformation.

1030 (LA-UR–93-3454) **Texture gradient effects in tantalum.** Wright, S.I. (Los Alamos National Lab., NM (United States)); Gray, G.T. III; Beaudoin, A.J. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309231–4: International conference on textures of materials, Clausthal (Germany), 20-24 Sep 1993). Order Number DE94000689. Source: OSTI; NTIS; GPO Dep.

The effects of inhomogeneities in texture on the mechanical response of a tantalum plate were investigated. Through-thickness compression samples exhibited an hourglass shape after deformation. The compression tests were modeled using a finite-element approach. A polycrystal plasticity model is embedded at each element of the mesh enabling the simulation to account for the spatial distribution of texture and its evolution. The texture was characterized using spatially specific individual lattice orientation measurements. The orientations were measured using automatic analysis of electron backscatter Kikuchi diffraction patterns. The influence of the spatially nonuniform distribution of texture on the experimental and simulated results is discussed. This work demonstrates the capability of currently available tools for characterizing inhomogeneous microstructures and modeling the effects of variations in texture on mechanical behavior.

1031 (LA-UR–93-3473) **Interplay of magnetic and superconducting heavy fermion ground states.** Heffner, R.H. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9304145–3: International workshop on low energy muon science (LEMS '93), Santa Fe, NM (United States), 4-8 Apr 1993). Order Number DE94000680. Source: OSTI; NTIS; GPO Dep.

This talk will focus recent developments in the understanding of heavy fermion (HF) superconductors and the role that positive muon spin relaxation (μSR) studies have played in helping to elucidate their properties. As illustrations two systems will be discussed: (1) UPd_2Al_3, one of the most recently discovered HF superconductors, which also displays coexisting magnetic order and (2) UBe_{13} doped with small quantities of Th substituted for U, which displays an interplay between its superconducting and magnetic ground states, leading to multiple superconducting states.

1032 (LA-UR–93-3504) **Cube texture generation dependence on deformation textures in cold rolled OFE copper.** Necker, C.T. (Los Alamos National Lab., NM (United States)); Rollett, A.D.; Doherty, R.D. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant DMR 9001378. (CONF-9309231–5: International conference on textures of materials, Clausthal (Germany), 20-24 Sep 1993). Order Number DE94000672. Source: OSTI; NTIS; GPO Dep.

The evolution of the α and β fiber deformation textures in OFE copper for von Mises strains of 1.0 to 4.5 is reported as well as how it affects the generation of cube recrystallization textures. Computational volume fraction analysis of the fibers indicates that the deformation texture evolves evenly along the length of the fibers. Fiber weakening during recrystallization does not occur more selectively in any one component or section of the fiber but occurs relatively evenly across the fiber. Cube grains grow without misorientation preference into the deformed structure. Microtextural analysis of the fully recrystallized samples indicates that the cube component (defined as less than 20° misorientation from {100}<001>) not only strengthens with increasing prior strain but also becomes much sharper, more closely aligned with the exact cube position. These results are explained by the evolution of the environment (texture and microstructure) surrounding potential nucleation sites.

1033 (LBL–33514) **Surface structure determinations of ordered sulfur overlayers on Mo(100) and Re(0001) by low-energy electron diffraction intensity analysis.** Jentz, D.W. Lawrence Berkeley Lab., CA (United States). Nov 1992. 221p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94001250. Source: OSTI; NTIS; GPO Dep.

A newly developed method for surface structure determination, tensor LEED, combined with automated search was used to analyze the structures. The ordered structures of S on Mo(100) which were studied formed a c(2 × 2), c(4 × 2), and p(2 × l) periodicities at coverages of 0.5, 0.75, 1.0 ML (monolayers, of one sulfur atom per one molybdenum atom) respectively. A MO_2S-like overlayer, which formed at coverages greater than 1.0 ML, is also discussed. Calculations for the c(2 × 2) structure gave a best fit geometry with S adsorbed in a four-fold symmetric hollow site and the second layer buckled by 0.09Å. The S-Mo bond length is 2.45Å and the Pendry R-factor is 0.21. Preliminary calculations for the c(4 × 2) structure did not yield an acceptable fit. The three models tried are discussed. Calculations for p(2 × l) data did not yield an acceptable geometry either. The types of models that were tried are discussed. Implications of this analysis are discussed along with results of a scanning tunneling microscopy (STM) investigation. The ordered structures on the RE(0001) surface studied have p(2 × 2) and (2$\sqrt{3}$ × 2$\sqrt{3}$)R30° periodicities and occurred at S coverages of 0.25 and 0.5 ML respectively. Best fit structure for p(2 × 2) structure has S adsorbed in a three-fold hollow hcp site and exhibits a buckling of the first and second Re layers. The first layer is buckled by 0.05Å and the second layer is buckled by 0.06Å. Re-S bond length is 2.32Å and Pendry R-factor is 0.21. Preliminary results of dynamical LEED investigation of (2$\sqrt{3}$ × 2$\sqrt{3}$)R30° structure show reasonable agreement with a model with a 6-S atom basis.

1034 (LBL–33786) **Quantitative analysis of Scanning Tunneling Microscopy images for surface structure determination: Sulfur on Re(0001).** Ogletree, D.F. (Lawrence Berkeley Lab., CA (United States)); Dunphy, J.C.; Salmeron, M.B.; Sautet, P. Lawrence Berkeley Lab., CA (United States). Feb 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930159–54: OE/LASE '93: International Society for Optical Engineering (SPIE) conference, Los

Angeles, CA (United States), 13-23 Jan 1993). Order Number DE93019235. Source: OSTI; NTIS; GPO Dep.

Scanning Tunneling Microscopy (STM) images of adsorbed atoms and molecules on single crystal substrates provide important information on surface structure and order. In many cases images are interpreted qualitatively based on other information on the system. To obtain quantitative information, a theoretical analysis of the STM image is required. A new method of calculating STM images is presented that includes a full description of the STM tip and surface structure. This method is applied to experimental STM images of sulfur adsorbed on Re(0001). Effects of adsorption site, adsorbate geometry, tip composition and tunnel gap resistance on STM image contrast are analyzed. The chemical identity of tip apex atom and substrate subsurface structure are both shown to significantly affect STM image contrast.

1035 (NUREG/CR–5981) **The effect of electric discharge machined notches on the fracture toughness of several structural alloys.** Joyce, J.A. (Naval Academy, Annapolis, MD (United States)); Link, R.E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Naval Academy, Annapolis, MD (United States); Naval Surface Warfare Center, Annapolis, MD (United States). Sep 1993. 84p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CDNSWC/SSM–61-93/01). Source: OSTI; NTIS; INIS; GPO.

Recent computational studies of the stress and strain fields at the tip of very sharp notches have shown that the stress and strain fields are very weakly dependent on the initial geometry of the notch once the notch has been blunted to a radius that is 6 to 10 times the initial root radius. It follows that if the fracture toughness of a material is sufficiently high so that fracture initiation does not occur in a specimen until the crack-tip opening displacement (CTOD) reaches a value from 6 to 10 times the size of the initial notch tip diameter, then the fracture toughness will be independent of whether a fatigue crack or a machined notch served as the initial crack. In this experimental program the fracture toughness (J_{Ic} and J resistance (J-R) curve, and CTOD) for several structure alloys was measured using specimens with conventional fatigue cracks and with EDM machined notches. The results of this program have shown, in fact, that most structural materials do not achieve initiation CTOD values on the order of 6 to 10 times the radius of even the smallest EDM notch tip presently achievable. It is found furthermore that tougher materials do not seem to be less dependent on the type of notch tip present. Some materials are shown to be much more dependent on the type of notch tip used, but no simple pattern is found that relates this observed dependence to the material strength toughness, or strain hardening rate.

1036 (ORNL/Sub–88-SB775/03) **Evaluation of the fabricability of advanced iron aluminide-clad austenitic stainless steel tubing.** Mohn, W.R. (Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div.); Topolski, M.J. Oak Ridge National Lab., TN (United States); Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div. Jul 1993. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93040598. Source: OSTI; NTIS; GPO Dep.

Researchers at Babcock & Wilcox Alliance Research Center have investigated methods to produce bimetallic tubing consisting of iron aluminide-clad austenitic stainless steel for practical use in fossil fueled energy equipment. In the course of this work, the compatibility of iron aluminide with four candidate austenitic stainless steel substrates was first evaluated using diffusion couples. Based on these results, a combination of iron aluminide and 304 stainless steel was selected for further development. Two composite billets of this combination were then prepared and extruded in separate trails at 2200F and 2000F. Both extrusions yielded 2-inch OD clad tubes, each approximately 18 feet long. Results of the evaluation show that the tube extruded at 2000F had a sound, integrally bonded clad layer throughout its entire length. However, the tube extruded at 2200F exhibited regions of disbonding between the clad layer and the substrate. In supplement to this work, an assessment of the technical and economic merits of iron aluminide-clad austenitic stainless steel components in power generation systems was conducted by B&W Fossil Power Division. Future activities should include an investigation of lower extrusion processing temperatures to optimize the fabrication of high quality iron-aluminide clad tubing.

1037 (ORNL/TM–12200) **Alloying effects on mechanical and metallurgical properties of NiAl.** Liu, C.T.; Horton, J.A.; Lee, E.H.; George, E.P. Oak Ridge National Lab., TN (United States). Jun 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93040814. Source: OSTI; NTIS; GPO Dep.

Alloying effects were investigated in near-stoichiometric NiAl for improving its mechanical and metallurgical properties. Ternary additions of 19 elements at levels up to 10 at. % were added to NiAl; among them, molybdenum is found to be most effective in improving the room-temperature ductility and high-temperature strength. Alloying with 1.0 $\pm$ 0.6% molybdenum almost doubles the room-temperature tensile ductility of NiAl and triples its yield strength at 1000C. The creep properties of molybdenum-modified NiAl alloys can be dramatically improved by alloying with up to 1% of niobium or tantalum. Because of the low solubilities of molybdenum and niobium in NiAl, the beneficial effects mainly come from precipitation hardening. Fine and coarse precipitates are revealed by both transmission electron microscopy (TEM) and electron microprobe analyses. Molybdenum-containing alloys possess excellent oxidation resistance and can be fabricated into rod stock by hot extrusion at 900 to 1050C. This study of alloying effects provides a critical input for the alloy design of ductile and strong NiAl aluminide alloys for high-temperature structural applications.

1038 (PNL-SA–20214) **Microstructural evolution of neutron-irradiated Fe-Cr-Ni ternary alloys at high helium generation rates.** Sekimura, N. (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.); Garner, F.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 21p. Sponsored by USDOE, Washington, DC (United States); Ministry of Education, Science and Culture (Japan). DOE Contract AC06-76RL01830. (CONF-920970–9: 3. conference on evolution of microstructure in metals during irradiation, Chalk River (Canada), 29 Sep - 2 oct 1992). Order Number DE93018786. Source: OSTI; NTIS; INIS; GPO Dep.

A series of Fe-Cr-Ni ternary alloy,, were irradiated to 12-14 dpa in the Oak Ridge Research Reactor (ORR). In this experiment, most of helium atoms were produced by the $^{58}Ni(n,\gamma)^{59}Ni(n,\alpha)^{56}Fe$ sequential reaction, and, therefore, the helium generation rate was almost proportional to the nickel content, ranging from 27 to 58 appm He/dpa in 20 to 45 wt.% Ni alloys. Irradiation temperatures were 330, 400, 500 and 600°C, and the specimen variables were the nickel level, the chromium level and cold working. The high levels helium, combined with details of the temperature history, were found to have dominated microstructural development, sometimes overwhelming and even reversing the action of a given material variable. Microscopy examination showed that there was an unprecedented refinement of cavity microstructure at all temperatures, which accounts for the substantial alterations in both swelling and mechanical properties observed in earlier studies.

1039 (RFP–4627) **JBK-75 stainless steel machinability study.** McManigle, A.P.; Simonis, A.W. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. 2 Sep 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94002268. Source: OSTI; NTIS; GPO Dep.

The study on forgings characterized machinability of the material by varying cutting speeds and feedrates utilizing four tools for the roughing operation and four tools for the semi-finish operation. Tools tested were obtained from four manufacturers. Twelve parts were machined utilizing an experimental design to determine all possible interactions between cutting speeds and feedrates. To evaluate the machinability of the material, quantitative measures in tool life, tool wear, surface finish, chip control, and material removal rates were analyzed. Benefits gained from this study are: higher material removal rates, longer tool life, minimal tool wear, improved chip control and reliability, increased productivity, and cost minimization.

1040 (SAND–92-2779C) **Interfacial reactions between titanium and borate glass.** Brow, R.K. (Sandia National Labs., Albuquerque, NM (United States)); Saha, S.K.; Goldstein, J.I. Sandia National Labs., Albuquerque, NM (United States). [1992]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930405–5: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE93012847. Source: OSTI; NTIS; GPO Dep.

Interfacial reactions between melts of several borate glasses and titanium have been investigated by analytical scanning electron microscopy (SEM) and x-ray photoelectron spectroscopy (XPS). A thin titanium boride interfacial layer is detected by XPS after short (30 minutes) thermal treatments. ASEM analyses after longer thermal treatments (8–120 hours) reveal boron-rich interfacial layers and boride precipitates in the Ti side of the interface.

1041 (SAND–93-1648C) **Chromate-free talc chemical conversion coatings for aluminum alloys.** Buchheit, R.G. (Sandia National Labs., Albuquerque, NM (United States)); Drewien, C.A.; Stoner, G.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-930571–28: 183. Electrochemical Society meeting, Honolulu, HI (United States), 16-21 May 1993). Order Number DE94001567. Source: OSTI; NTIS; GPO Dep.

We have found that aluminum alloys exhibit unusual passivity when exposed to alkaline Li-salt solutions. Observed passivity is due to the formation of a polycrystalline $Li_2[Al_2(OH)_6]_2 \cdot CO_3 \cdot 3H_2O$ film on the aluminum surface. This film is persistent in aggressive environments and provides a significant degree of corrosion protection. On this basis, we have developed a simple non-electrolytic method of forming corrosion resistant coatings in alkaline Li-salt solution. This process is procedurally similar to traditional conversion coating methods, offers desirable properties, and has a low toxic hazard. In this paper, coating methods, coating characterization, and coating properties are presented. Results from parallel test performed with a commercial chromate conversion coatings are presented for comparison.

1042 (SKB-TR–92-45) **Mechanical integrity of canisters.** Nilsson, Fred (comp.) (Royal Inst. of Tech., Stockholm (Sweden)). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 116p. Order Number DE94605305. Source: OSTI; NTIS; INIS.

This document constitutes the final report from 'SKBs reference group for mechanical integrity of canisters for spent nuclear fuel'. A complete list of all reports initiated by the reference group can be found in the summary report in this document. The main task of the reference group has been to advice SKB regarding the choice (ranking of alternatives) of canister type for different types of storage. The choice should be based on requirements of impermeability for a given time period and identification of possible limiting mechanisms. The main conclusions from the work were: From mechanical point of view, low phosphorous oxygen free copper (Cu-OFP) is a preferred canisters material. It exhibits satisfactory ductility both during tensile and creep testing. The residual stresses in the canisters are of such a magnitude that the estimated time to creep rupture with the data obtained for the Cu-OFP material is essentially infinite. Based on the present knowledge of stress corrosion cracking of copper there appears to be a small risk for such to occur in the projected environment. This risk need some further study. Rock shear movements of the size of 10 cm should pose no direct threat to the integrity of the canisters. Considering mechanical integrity, the composite copper/steel canister is an advantageous alternative. The recommendations for further research included continued studies of the creep properties of copper and of stress corrosion cracking. However, the studies should focus more directly on the design and fabrication aspect of the canister.

1043 (SR/H–652) **Project 981081-20, Savannah River Plant, 200 Area, Bldg. 221H, materials engineering activity, dissolver columns, materials for HNO_3-HF service.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 29 Dec 1958. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002220. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Some difficulties due to weld cracking are usually anticipated when fabricating 309SCb stainless steel equipment. There is some past history of difficulties in meeting boiling nitric acid test requirements with certain heats of 309SCb which have the specified chemical composition. In setting up materials and fabrication specifications for the dissolver columns all available know how regarding the corrosion resistance of 309SCb plus new data developed at ERL specifically for this application were utilized.

1044 (SR/H–653) **Project 981081, Savannah River Plant, 200 Area, Building 221H, materials engineering, dissolver columns: Summary of procurement and fabrication experience.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 13 Feb 1959. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002249. Source: OSTI; NTIS (US Sales Only); GPO Dep.

In view of the difficulties encountered in the procurement of certain components to specification requirements and in welding during fabrication of the units, and because the corrosion resistance of welds has been poorer that anticipated, pertinent information concerning these problems has been summarized in this letter in the hope that it will be of value when 309SCb equipment is to be fabricated in the future.

1045 (SR/H–656) **Oxalic acid and Huey test for type 304-L stainless steel.** Warren, J.H. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 24 Jan 1961. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002252. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a discussion of the oxalic acid and huey test for type 304-L Stainless Steel.

1046 (SR/H–657) **Acceptance tests for stainless steels.** Hein, E.A. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 28 Mar 1961. 7p. DOE Contract AC09-76SR00001. Order Number DE94002253. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum summarizes procedures and recommendations regarding determination of stainless steel quality.

1047 (SR/H–658) **Oxalic acid and Huey test for type 304-L stainless steel.** Christl, R.J. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 30 Mar 1961. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002254. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides recommendations with regard to the testing and quality of 304-L Stainless Steel.

1048 (SR/H–659) **Savannah River Plant, 200 Area, Canyon evaporator reboiler, Materials Engineering, Comparison of Hanford and Savannah river tubing.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 3 May 1961. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002255. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a comparison of Hanford and Savannah River tubing with regard to manufacturing and inspection procedures.

1049 (SR/H–660) **W.R. 850517-10, Savannah River Plant, Stainless Steel Development Program, Materials Engineering, 309S Cb seamless tubing from Union Steel.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 14 Jun 1961. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002256. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides a discussion of a visit to the Union Steel Corporation to examine hot-extruded tube hollows and cold-drawn one inch schedule 40 pipe of Stainless Steel-309S.

1050 (SR/H–661) **Explosives Department, Savannah River Plant, 200 Area, Materials Engineering, Comments on Hanford tubing specification.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 15 Sep 1961. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94002257. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides comments on the Hanford specifications for Stainless Steel tubing.

1051 (UCRL-ID–114590) **Tensile properties of 21-6-9 stainless steel at elevated temperatures.** Torres, S.G.; Henshall, G.A. Lawrence Livermore National Lab., CA (United States). Oct 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001852. Source: OSTI; NTIS; GPO Dep.

Tensile properties of Type 21-6-9 austenitic stainless steel were measured at temperatures ranging from ambient to 1200C at a strain rate of 6.67×10^{-4} s^{-1}. Data show that yield stress decreases rapidly from room temperature to about 300C, followed by a nearly constant value in the 'plateau' region from 300 to 600C. Beyond the "plateau," there is more rapid drop in yield stress as temperature increases. Ultimate tensile stress shows a plateau between 300 and 700 C, which may be caused by solutes. 21-6-9 stainless steel has excellent ductility, with the elongation to failure ranging from 55 to 95%. It appears that there is a local minimum in the ductility at approximately 700C. Results are compared with earlier results of Kassner and co-workers.

1052 (UCRL-ID–114706) **Determination of the compatibility between structural alloys and molten metals at high temperatures.** Henshall, G.A.; Wagner, L.M.; Westfall, B.A.; Kershaw, R.P. Lawrence Livermore National Lab., CA (United States). 9 Aug 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000954. Source: OSTI; NTIS; GPO Dep.

The experimental methods for determining high-temperature compatibility between structural alloys and molten metals, particularly braze alloys, have been established. The structural alloys of interest are formed or machined into small crucibles into which the metal to be melted is placed. This system is placed in a furnace which typically will have a vacuum or inert gas environment; other atmospheres are possible as well. Multiple crucibles are exposed for various times and temperatures. Following cooling, a visual examination for loss of containment is performed. Each crucible is then sectioned and examined metallographically to document any loss in thickness of the crucible or any reactions between the materials. These procedures are fairly simple and require only common laboratory equipment; costs, therefore, are kept low. These experimental techniques were refined for use in determining the compatibility of both commercially pure vanadium and 21-6-9 stainless steel with a 92.5% Pb-5% In-2.5% Ag braze alloy. Both the vanadium and the stainless steel contained the molten Pb-In-Ag alloy for exposures ranging from 1000C for 10 minutes up to 1200C for 2 hours.

1053 (UCRL-JC–112054) **Transmission electron microscopy study of thick copper-304 stainless steel multilayers.** Wall, M.A.; Barbee, T.W. Jr.; Weihs, T. Lawrence Livermore National Lab., CA (United States). 8 Jun 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–45: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94001045. Source: OSTI; NTIS; GPO Dep.

Thick (10 to 25 μm), free-standing, equal layer thickness, Copper(Cu)-304 Stainless Steel(SS) multilayer foils, having periods of 1 to 100 nm, synthesized by magnetron sputter deposition, were examined by plan view and cross-sectional transmission electron microscopy. Multilayer growth morphology, individual layer structure and crystallographic phase orientation relationships were characterized in this study. Electron Energy Loss filtered imaging of a 20 nm period multilayer cross-section was also performed and showed that nickel had diffused into the Cu layers from the SS during synthesis. X-ray powder diffraction scans were performed and analyzed. A pure deposit of 304SS was synthesized and had a metastable BCC structure. Multilayer samples having periods of 20 nm were found to have a coherent layered Cu(FCC)SS(FCC) structure. At larger periods (50 & 100 nm) a bimodal Cu(FCC)-SS(FCC & BCC) structure was formed. These observations show that the 304SS will grow with a metastable BCC structure when sputter deposited. When layered with Cu(FCC) the 304SS has its equilibrium FCC structure at layer thicknesses up to 10nm as a result of epitaxy with the copper. At larger SS layer thicknesses the SS appears to locally transform to the metastable BCC structure during synthesis, refining the grain structure of the depositing SS layer and the subsequent Cu layer. This transformation significantly increases the strength of the larger period multilayer.

1054 (UCRL-JC–112347-Rev.1) **Molecular dynamics modeling of the mechanical behavior of metallic multilayers: Revision 1.** Belak, J.; Boercker, D.B. Lawrence Livermore National Lab., CA (United States). Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–38-Rev.1: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE93019947. Source: OSTI; NTIS; GPO Dep.

Constant-stress molecular dynamics simulations are used to study the mechanical properties of equal concentration Cu-Ni (111) metallic multilayers of repeat lengths 0.4–5.0 nm. Uniaxial stress is applied along the close-packed [110] and perpendicular to the close-packed [112] directions within the (111) plane. The observed elastic modulus does not display a super-modulus effect as observed in experimental bulge tests for the biaxial modulus. However, both the average interlayer spacing and the out-of-plane Poisson ratio display anomalous effects for multilayer repeat lengths below about two nanometers.

1055 (UCRL-JC–112763) **Mechanical behavior of tungsten shaped charge liner materials.** Lassila, D.H. Lawrence Livermore National Lab., CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309224–2: Ballistics 93: 14. international symposium on ballistics, Quebec (Canada), 26-29 Sep 1993). Order Number DE93040483. Source: OSTI; NTIS; GPO Dep.

Radiographs of jets produced by shaped charges with tungsten liners have documented both ductile and brittle breakup behavior. The relationships between the varying breakup behavior of tungsten shaped charge jets and metallurgical characteristics and/or mechanical behavior of the liner are not understood. In this paper the mechanical behavior of warm-forged and chemical-vapor-deposition (CVD) tungsten is discussed relative to the typical deformation history of an element of liner material which becomes part of the jet. The analyses suggest the following: (1) tungsten liner material is damaged, or possibly pulverized, during shock loading at the high-explosive detonation front; (2) pulverized material is consolidated in the convergence zone under conditions of high pressure, and (3) variations in observed breakup behavior of tungsten may be related to high temperature embrittlement. The low temperature ductile-brittle transition temperature of tungsten (DBTT) is not believed to be directly related to observed variations in break-up behavior of jets.

1056 (UCRL-JC–113300) **First-principles pressure-temperature phase diagrams in metals.** Moriarty, J.A. Lawrence Livermore National Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–55: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001056. Source: OSTI; NTIS; GPO Dep.

Using interatomic potentials derived from first-principles generalized pseudopotential theory, finite-temperature phase transitions in both simple and transition metals can be studied through a combination of analytic statistical methods and molecular-dynamics simulation. In the prototype simple metal-Mg, where volume and pair forces adequately describe the energetics, a complete and accurate phase diagram has thereby been obtained to 60 GPa. A rapidly temperature-dependent hcp-bcc phase line is predicted which ends in a triple point on the melting curve near 4 GPa. In

central transition metals such as Mo or Fe, on the other hand, the energetics are complicated by d-state interactions which give rise to both many-body angular forces and enhanced electron-thermal contributions. We have made a detailed study of these phenomena and their impact on melting in the prototype case of Mo and a full melting curve to 2 Mbar has been obtained. In the case of Fe, we are examining the high-pressure phase diagram and the question of whether or not there exists a high-pressure, high-temperature solid bcc phase, as has been speculated. To date, we have shown that the bcc structure is both thermodynamically and mechanically unstable at high pressure and zero temperature, with a large and increasing bcc-hcp energy difference under compression.

1057 (UCRL-JC–113778) **Observation of x-ray absorption magnetic circular dichroism in well-characterized iron-cobalt-platinum multilayers.** Jankowski, A.F.; Waddill, G.D.; Tobin, J.G. Lawrence Livermore National Lab., CA (United States). Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–42: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94000303. Source: OSTI; NTIS; GPO Dep.

Magnetic circular dichroism in the Fe 2p x-ray absorption is observed in multilayers of$(Fe9.5Å/Pt9.5Å)_{92}$. The magnetization and helicity are both in the plane of this multilayer which is prepared by magnetron sputter deposition. This sample is part of a study to examine magnetization in the ternary multilayer system of FeCo/Pt. Lattice and layer pair spacings are measured using x-ray scattering. The atomic concentration profiles of the multilayer films are characterized using Auger electron spectroscopy coupled with depth profiling. Conventional and high resolution transmission electron microscopy are used to examine the thin film, growth morphology and atomic structure.

1058 (UCRL-JC–113779) **Interface science of controlled metal/metal and metal/ceramic interfaces prepared using ultra-high vacuum diffusion bonding.** King, W.E.; Campbell, G.H.; Coombs, A.W.; Johnson, G.W.; Kelly, B.E.; Reitz, T.C.; Stoner, S.L.; Wien, W.L.; Wilson, D.M. Lawrence Livermore National Lab., CA (United States). Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–46: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94001066. Source: OSTI; NTIS; GPO Dep.

We have designed, constructed, and are operating a capability for production of controlled homophase and heterophase interfaces: an ultrahigh vacuum diffusion bonding machine. This machine is based on a previous design which is operating at the Max Planck Institut fuer Metallforschung, Institut fuer Werkstoffwissenschaft, Stuttgart, FRG. In this method, flat-polished single or polycrystals of materials with controlled surfaced topography can be heat treated up to 1500C in ultrahigh vacuum. Surfaces of annealed samples can be sputter cleaned and characterized prior to bonding. Samples can then be precisely aligned crystallographically to obtain desired grain boundary misorientations. Material couples can then be bonded at temperatures up to 1500C and pressures up to 10 MPa. Results are presented from initial work on Mo grain boundaries and Cu/Al_2A_3 interfaces.

1059 (UCRL-JC–113795) **Strengthening and toughening in refractory metal alloys.** Wadsworth, J. (Lawrence Livermore National Lab., CA (United States)); Nieh, T.G.; Wittenauer, J. Lawrence Livermore National Lab., CA (United States). Mar 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930317–2: Conference on critical issues in the development of high temperature structural materials, Kona, HI (United States), 7-12 Mar 1993). Order Number DE93019942. Source: OSTI; NTIS; GPO Dep.

Development and application of refractory metal alloys for high-temperature aerospace structures is reviewed. The use of refractory metals is often limited by poor room temperature properties, inadequate oxidation resistance at elevated temperatures, or difficulties associated with joining, welding, or forming. Materials selection criteria for high-temperature structures are reviewed with an emphasis placed upon the distinctions between refractory metals and competing high-temperature materials – including carbon, ceramics, and intermetallics. Each class of materials has inherent limitations which govern application. In some cases, materials limitations are being solved through the use of engineered materials hybrids such as ceramic-coated refractory metals or ceramics roughened with a ductile refractory metal phase. For many applications, use of ceramics and intermetallics is limited by their technological immaturity. For example, current understanding and application of molybdenum-based materials is based upon nearly 40 years of application experience in high-temperature structures. As an example of a materials development and qualification program, a brief synopsis of molybdenum alloy development is presented. Topics surveyed include recent advances in the understanding of the role of oxygen on the room temperature brittle behavior problem in molybdenum alloys.

1060 (UCRL-JC–113802) **Photoelectron holography of platinum (111).** Petersen, B.L. (Lawrence Berkeley Lab., CA (United States)); Terminello, L.J.; Barton, J.J.; Shirley, D.A. Lawrence Livermore National Lab., CA (United States). Apr 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–41: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE93040856. Source: OSTI; NTIS; GPO Dep.

Platinum atoms near a (111) single-crystal face have been imaged using photoelectron holography. Electron angular intensity patterns were collected at equally spaced wavenumbers from 6 to $12Å^{-1}$. Images of atoms near expected atomic positions are obtained from single-wavenumber analyses over the range of the data set. Positions are detected further from the emitter than we have seen previously, and symmetry assumptions are not required. We have also adopted a three dimensional means of representing the data in order to help understand the results. Twin image suppression and artifact reduction in the holographically reconstructed data are set are obtained when images at different wavenumbers are correctly phase-summed. We are assessing the capability of the technique for rendering true three-dimensional structural information for unknown systems.

1061 (UCRL-JC–113810) **Phase transformations in Cu-Zr multilayers.** Weihs, T.P.; Barbee, T.W. Jr.; Wall, M.A. Lawrence Livermore National Lab., CA (United States). Apr 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–43: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94000393. Source: OSTI; NTIS; GPO Dep.

A study of phase transformations is reported for Cu-rich, Cu-Zr multilayer foils synthesized using magnetron sputter deposition and annealed using a differential scanning calorimeter. The foils range in composition from 1.6 to 9.0 at% Zr and consist of alternate layers of polycrystalline Cu and Zr. Differential scanning calorimetry, X-ray analysis and electron microscopy were used to three distinct reactions in the foils: a mixing and an amorphization of the Cu and die Zr, a crystallization on of this amorphous phase to the metastable intermetallic $Cu_{51}Zr_{14}$, and a transformation of the $Cu_{51}Zr_{14}$ phase into the equilibrium phase Cu_9Zr_2. The as-deposited layering remained stable during the first two reactions and then broke down in the third reaction as large grains of Cu_9Zr_2 encompassed the smaller Cu grains. Heats of the reactions and activation energies of these reactions are measured and are compared to values reported for bulk samples. The measured heats provide evidence that amorphous Cu-Zr alloys phase separate and that mixing and short range ordering produce 3.5 times more heat than long range ordering produces when Ca and Zr react and form $Cu_{51}Zr_{14}$.

1062 (UCRL-JC–114114) **The history of development of molybdenum alloys for structural applications.** Wadsworth, J. (Lawrence Livermore National Lab., CA (United States)); Wittenauer, J.P. Lawrence Livermore National Lab., CA (United States). Feb 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9302103–5: 122. annual meeting of the Minerals, Metals and Materials Society (TMS), Denver, CO (United States), 21-25 Feb 1993). Order Number DE94000389. Source: OSTI; NTIS; GPO Dep.

Molybdenum was first isolated as an element in 1893 and found initial commercial application as a filament support for incandescent lamps in 1910. The advent of arc melting practice in the 1940s led to an increase in availability of Mo sheet, bar, and plate products. Alloy development programs were heavily supported starting in the 1950s and several key alloys emerged over the next twenty years that remain in use to the present time such as Mo-TZM, unalloyed Mo, and Mo-Re. In recent years, improved understanding of the role of oxygen and carbide distributions at grain boundaries have led to increased reliability and use of Mo in aerospace products. Current developmental programs in areas of propulsion and energy conversion will ensure the prominent position of Mo as a high-temperature structural material. This paper highlights some of these key developments in the evolution of Mo alloys.

1063 (UCRL-JC–114157) **Using the rule of mixtures to examine the hardness of Cu/Cu-Zr multilayers.** Weihs, T.P.; Barbee, T.W. Jr.; Wall, M.A. Lawrence Livermore National Lab., CA (United States). Jun 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930405–44: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94001068. Source: OSTI; NTIS; GPO Dep.

Cu/Cu-Zr multilayer foils were fabricated and indented to determine the degree to which multilayer hardness is enhanced by increasing the volume fraction of the harder phase. Using sputter deposition and thermal processing a series of foils was fabricated in which the thicknesses of the Cu layers remained fixed while the thicknesses of the alternate Cu-Zr layers varied. These samples were then indented both parallel and normal to their layering. In general hardness increased as the volume fraction of the harder Cu-Zr phase rose. When the films were loaded parallel to their layering, the measured hardnesses were higher and the dependencies on volume fraction of the Cu-Zr phase were stronger than when the films were loaded nominal to their layering. These results agree with predictions based on isostress and isostrain theories. The relations between hardness and volume fraction are used to compare the hardnesses of the Cu-Zr phases: amorphous Cu-Zr, $Cu_{51}Zr_{14}$ and Cu_9Zr_2, and to show that the hardness of the textured, as-deposited Zr layers is highly anisotropic.

1064 (UCRL-JC–114779) **Transferable tight-binding parameters: An application to Ni and Ni-Al alloys.** Sluiter, M.H.F.; Singh, P.P. Lawrence Livermore National Lab., CA (United States). Jul 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930759–2: NATO advanced study workshop on metallic alloys: experimental and theoretical perspectives, Boca Raton, FL (United States), 16-21 Jul 1993). Order Number DE94001044. Source: OSTI; NTIS; GPO Dep.

Two approaches for obtaining tight-binding parameters for metallic alloys are compared and contrasted with special regard for the application to large scale simulations such as may occur in tight-binding molecular dynamics studies.

1065 (WAPD-T–2991) **Irradiation damage behavior of low alloy steel wrought and weld materials.** Stofanak, R.J.; Poskie, T.J.; Li, Y.Y.; Wire, G.L. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-89PN38014. (CONF-930825–7: 6. international symposium on environmental degradation of materials in nuclear power systems: water reactors, San Diego, CA (United States), 3-5 Aug 1993). Order Number DE94000519. Source: OSTI; NTIS; INIS; GPO Dep.

A study was undertaken to evaluate the irradiation damage response of several different types of low alloy steel: vintage type ASTM A302 Grade B (A302B) plates and welds containing different Ni and Cu concentrations, 3.5% Ni steels similar to ASTM A508 Class 4, welds containing about 1% Ni (similar to type 105S), and 3.5% Ni steels with "superclean" composition. All materials were irradiated at several different irradiation damage levels ranging from 0.0003 to 0.06 dpa at 232C (450F). Complete Charpy V-notch impact energy transition temperature curves were generated for all materials before and after irradiation to determine transition temperature at 41J (30 ft-lb) or 47J (35 ft-lb) and the upper shelf energy. Irradiation damage behavior was measured by shift in Charpy 41J or 47J transition temperature ($\Delta TT4_{41J}$ or ΔTT_{47J}) and lowering of upper shelf Charpy energy at a given irradiation damage level. It was found that chemical composition greatly influenced irradiation damage behavior; highest irradiation damage (greatest ΔTT) was found in an A302B type weld containing 1.28% Ni and 0.20% Cu while the least damage was found in 3.5% Ni, 0.05% Cu, superclean wrought materials. Combination of Ni and Cu was found to affect irradiation damage behavior at higher irradiation damage levels in the A302B welds where the 1.28% Ni, 0.20% Cu weld showed more damage than a 0.60% Ni, 0.31% Cu weld. For the 3.5% Ni steels, fabrication influenced irradiation behavior in that a silicon (Si) killed material showed greater irradiation damage than a low silicon material. In general, the 3.5% Ni materials with low copper showed less irradiation damage than the A302B materials.

1066 (WAPD-T–3004) **Characterization and modeling of the heat source.** Glickstein, S.S.; Friedman, E. Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab. [1993]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. Order Number DE94001754. Source: OSTI; NTIS; GPO Dep.

A description of the input energy source is basic to any numerical modeling formulation designed to predict the outcome of the welding process. The source is fundamental and unique to each joining process. The resultant output of any numerical model will be affected by the initial description of both the magnitude and distribution of the input energy of the heat source. Thus, calculated weld shape, residual stresses, weld distortion, cooling rates, metallurgical structure, material changes due to excessive temperatures and potential weld defects are all influenced by the initial characterization of the heat source. Understandings of both the physics and the mathematical formulation of these sources are essential for describing the input energy distribution. This section provides a brief review of the physical phenomena that influence the input energy distributions and discusses several different models of heat sources that have been used in simulating arc welding, high energy density welding and resistance welding processes. Both simplified and detailed models of the heat source are discussed.

1067 (WSRC-MS–93-010) **Corrosion failures of austenitic stainless steel piping.** Louthan, M.R. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931232–1: 1. international symposium on process industry piping, Orlando, FL (United States), 14-17 Dec 1993). Order Number DE94001196. Source: OSTI; NTIS; GPO Dep.

The safe and efficient operation of many chemical/industrial systems requires the continued integrity of the process piping; this is achieved through a complex series of interactions influenced by design, fabrication, construction, operation, inspection and lay-up requirements. Potential material-enviroment interactions are frequently, if evaluated at all, relegated to secondary considerations. This tendency virtually assures corrosion induced degradation of the process piping systems. Pitting, crevice attack, stress cracking, microbiologically influenced corrosion, intergranular attack and corrosion fatigue have caused leaks, cracks, failures and shutdown of numerous process systems. This paper uses the lessons learned from failure analysis to emphasize the importance of an integrated material program to system success. The necessity of continuing evaluation if also emphasized through examples of failures which were associated with materials-environment interactions caused by slight alterations of processes and/or systems.

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Refer also to citation(s) 178, 206, 356, 508, 878, 965, 987, 992, 1007, 1010, 1024, 1028, 1125, 1141, 1382, 1818, 1843, 1876, 2581, 2597, 2600, 2602, 2603, 2609, 2762

1068 (ANL/CHM/CP–79242) **Synthesis and characterization of charge-substituted garnets $YCaLnGa_5O_{12}$ (Ln = Ce,Pr,Tb).** Gramsch, S.A. (Argonne National Lab., IL (United States)); Morss, L.R. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-31109-ENG-38. (CONF-9309142–4: 20. rare earth research conference, Monterey, CA (United States), 12-17 Sep 1993). Order Number DE93040227. Source: OSTI; NTIS; INIS; GPO Dep.

A low temperature method is described for the preparation of the new garnet compounds $YCaLnGa_5O_{12}$ (Ln=Ce, Pr, Th). In this set of compounds (Ca^{2+} + Ln^{4+}) replaces 2 Y^{3+} in the parent gallium based garnet $Y_3Ga_5O_{12}$ in order to stabilize as effectively as possible the Ln^{4+} species in the eight-coordinate "A" site of the garnet structure. Characterization of the oxides by x-ray powder diffraction and thermogravimetric analysis is discussed with regard to the structural relationship of the substituted compound to the parent material. The tetravalent ions Pr^{4+} and Tb^{4+} exhibit increased thermal stability in reducing conditions as compared to the Ln^{4+} states in the fluorite (LnO_2) and perovskite ($BaLnO_3$) type structures. This result is discussed with reference to the complex crystal chemistry of these systems.

1069 (ANL/ET/CP–79207) **Disks of $YBa_2Cu_3O_7$ shocked to 10 GPa pressures.** Nellis, W.J. (Lawrence Livermore National Lab., CA (United States)); Weir, S.T.; Hinsey, N.A.; Balachandran, U.; Kramer, M.J.; Raman, R. Argonne National Lab., IL (United States); Lawrence Livermore National Lab., CA (United States); Ames Lab., IA (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ;W-7405-ENG-48 ;W-7405-ENG-82. (UCRL-JC–113413;CONF-930676–53: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94000464. Source: OSTI; NTIS; GPO Dep.

The brittle superconducting oxide $YBa_2Cu_3O_7$ was shocked to 6.6 and 10.3 GPa without macroscopic fracture. The melt-textured disk-shaped specimen was preferentially oriented and was shock-compressed at an angle of about 30° from the effective c axis of this orthorhombic-phase specimen. Subsequent anneals of the 6.6 GPa specimen in oxygen at 890°C produced a magnetic hysteresis which is enhanced relative to the initial unshocked state, as expected for shock-induced defects.

1070 (ANL/ET/CP–79613) **Surface and subsurface defect detection in Si_3N_4 components by laser scattering.** Steckenrider, J.S.; Ellingson, W.A. Argonne National Lab., IL (United States). [1993]. 23p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308167–2: 20. annual review of progress in quantitative nondestructive evaluation (NDE), Brunswick, ME (United States), 1-6 Aug 1993). Order Number DE93040829. Source: OSTI; NTIS; GPO Dep.

Lifetimes of Si_3N_4 components that experience contact fatigue (e.g., bearings) are affected by defects (voids, inclusions, etc.) at or near the surface (<200 μm). An optical technique was developed for rapid detection and quantification of defects in both surface and subsurfaces, as well as characterization of subsurface microstructure. This laser scattering technique was applied to various Si_3N_4 component shapes. Polarization techniques were used to independently analyze surface and subsurface material, and surface defects such as Vickers indent markings were detected at 10–50 μm; subsurface defects were also detected (simulated voids at depths up to 100 μm below surface). Subsurface microstructure (locally high porosity, grain orientation variations) has been characterized.

1071 (ANL/IPNS/CP–79265) **Crystal structure and short-range oxygen defects in La- and Nd-modified ZrO_2.** Loong, C.K. (Argonne National Lab., IL (United States)); Richardson, J.W. Jr.; Ozawa, M.; Kimura, M. Argonne National Lab., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309142–3: 20. rare earth research conference, Monterey, CA (United States), 12-17 Sep 1993). Order Number DE93040229. Source: OSTI; NTIS; INIS; GPO Dep.

The crystal structure of rare-earth modified zirconia and the associated oxygen defects were studied by neutron diffraction. A Rietveld analysis of the neutron powder patterns of heat treated samples of La- and Nd- 10mol%-ZrO_2 revealed the composition of a major tetragonal phase (space group $P4_2/nmc$) and a minor cubic phase (space group Fm3m). The sort-range oxygen defects structure was examined by a Fourier-filtering technique. A real-space correlation function, obtained from a Fourier transform of the filtered residual diffuse scattering, showed evidence of static, oxygen-vacancy induced atomic displacements along the <111> and other directions of the pseudocubic cell.

1072 (ANL/MCT/CP–79124) **Crystal chemistry and self-lubricating properties of monochalcogenides gallium selenide and tin selenide.** Erdemir, A. Argonne National Lab., IL (United States). Feb 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310170–1: American Society of Mechanical Engineers/Society of Tribologists and Lubrication Engineers (ASME/STLE) joint tribology cconference, New Orleans, LA (United States), 24-27 Oct 1993). Order Number DE93041177. Source: OSTI; NTIS; GPO Dep.

This paper describes the fundamentals of the crystal chemistry and self-lubricating mechanisms of two monochalcogenides; tin selenide and gallium selenide. Specifically, it enumerates their inter-atomic array and bond structure in crystalline states, and correlates this fundamental knowledge with their self-lubricating capacity. Friction tests assessing the self-lubricating performance of gallium and tin selenides were carried out on a pin-on-disk machine. Specifically, large crystalline pieces of gallium selenide and tin selenide were cut and cleaved into flat squares and subsequently rubbed against the sapphire balls. In another case, the fine powders (particle size ≈ 500–100 μm) of gallium selenide and tin selenide were manually fed into the sliding interfaces of 440C pins and 440C disks. For the specific test conditions explored, it was found that the friction coefficients of the sapphire/gallium selenide and sapphire/tin selenide pairs were ≈ 0.23 and ≈ 0.35, respectively. The friction coefficients of 440C pin/440C disk test pairs with gallium selenide and tin selenide powders were on the orders of ≈ 0.22 and ≈ 0.38, respectively. For comparison, a number of parallel friction tests were performed with MoS_2 powders and compacts and the results of these tests were also reported. The friction data together with the crystal-chemical knowledge and the electron microscopic evidence supported the conclusion that the lubricity and self-lubricating mechanisms of these solids are closely related to their crystal chemistry and the nature of interlayer bonding.

1073 (ANL/MSD/CP–80634) **The effect of correlated and point defects on the vortex lattice melting transition in single crystal $YBa_2Cu_3O_{7-\delta}$.** Kwok, W.K. (Argonne National Lab., IL (United States)); Fleshler, S.; Welp, U.; Downey, J.; Crabtree, G.W.; Fendrich, J. Argonne National Lab., IL (United States). Aug 1993. 31p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR91-20000. (CONF-930801–12: Conference of the International Union of Pure and Applied Physics on low temperature physics (LT 20), Eugene, OR (United States), 1-11 Aug 1993). Order Number DE93040277. Source: OSTI; NTIS; INIS; GPO Dep.

The vortex melting transition T_m in several untwinned and twinned crystals measured resistively in fields up to 8 Tesla. A Lindemann criterion for vortex lattice melting is obtained in addition to a sharp hysteresis in the magnetoresistance at B_m supporting a first order phase transition. The anisotropy of twin boundary pinning and its reduction of the "kink" in $\rho(T)$ associated with the first order melting transition is discussed in samples with very dilute twin boundaries. We also report on direct suppression of melting transition by intrinsic pinning for H || ab and by electron-irradiation-induced point defects.

1074 (ANL/MSD/CP–80635) **High oxygen pressure synthesis of new copper oxide superconductors.** Dabrowski, B. (Northern Illinois Univ., De Kalb, IL (United States). Dept. of Physics); Zhang-MacCoy, V.; Wang, Z.; Hannon, R.; Jorgensen, J.D.; Hunter, B.A.; Hinks, D.G.; Wagner, J.L.; Hitterman, R.L. Argonne National Lab., IL (United States). Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant DMR87-19738. (CONF-930710–1: Physics and chemistry of molecular and oxide superconductors, Eugene,

OR (United States), 27-31 Jul 1993). Order Number DE93040278. Source: OSTI; NTIS; INIS; GPO Dep.

The unique coordination of the copper ions in +1, +2, and +3 oxidation states which are stable in a range of oxygen partial pressure, $10^{-6} < P(O_2) < 10^3$ atm, makes possible the formation of a wide variety of distinct structures. By controlling the oxygen pressure during the synthesis and annealing, the distribution of metal- and oxygenions can be modified on an atomic scale to optimize the structural and electronic properties. We present several examples of compounds for which the critical structural elements for superconductivity, i.e. the perfectly ordered CuO_2-planes, have been obtained and doped with holes by means of high oxygen pressure, $P(O_2) > 1$ atm. These materials, $La_2CuO_{4+\delta}$, $La_{2-x}Ca_xCuO_4$ and $YSr_{2-x}La_xCu_3O_{7+\delta}$ offer a unique opportunity to study the relationship between superconductivity and structural, magnetic and chemical properties.

1075 (ANL/MSD/CP–80681) **de Haas-van Alphen measurements in $Ba_{0.6}K_{0.4}BiO_3$.** Goodrich, R.G. (Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Physics); Grienier, C.; Hall, D. Argonne National Lab., IL (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38 ;W-7405-ENG-36. (LA-UR–93-3127;CONF-930367–9: Conference on spectroscopies in novel superconductors, Santa Fe, NM (United States), 17-19 Mar 1993). Order Number DE93041169. Source: OSTI; NTIS; GPO Dep.

dHvA measurements were made on the 32 K cubic superconductor $Ba_{0.6}K_{0.4}BiO_3$ using a 50 Tesla pulsed field magnet at NHMFL (Los Alamos) and a 18 T superconducting magnet (LSU). Data were taken with the magnetic field aligned along the (001) direction, at 1.5 to 3.9 K. The pulsed fields were high enough to drive the system well into the normal state. Analysis shows that the frequencies of the observed dHvA oscillations arise from a several Fermi surface sheets. One cross section was nearly identical with that predicted by a new LDA calculation.

1076 (ANL/MSD/CP–80860) **Spin dynamics and implications for superconductivity: Some problems with the d-wave scenario.** Levin, K. (Chicago Univ., IL (United States). Dept. of Physics); Zha, Y.; Radtke, R.J.; Si, Q.; Norman, M.R.; Schuttler, H.B. Argonne National Lab., IL (United States). Sep 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930710–3: Physics and chemistry of molecular and oxide superconductors, Eugene, OR (United States), 27-31 Jul 1993). Order Number DE94001183. Source: OSTI; NTIS; INIS; GPO Dep.

We review the spin dynamics of the normal state of the cuprates with special emphasis on neutron data in both the $YBa_2Cu_3O_{7-\delta}$ and $La_{2-x}Sr_xCuO_4$ systems. When realistic models of the Fermi surface shapes are incorporated, along with a moderate degree of spin fluctuations, we find good semi-quantiative agreement with experiment for both cuprates. Building on the success of this Fermi-liquid-based scheme, we explore the implications for d-wave pairing from a number of vantage points. We conclude that our present experimental and theoretical understanding is inadequate to confirm or refute the d-wave scenario.

1077 (ANL/MSD/CP–80962) **Anisotropic uniaxial pressure effects in $YBa_2Cu_3O_{7-\delta}$.** Welp, U.; Grimsditch, M.; Fleshler, S.; Nessler, W.; Veal, B.; Crabtree, G.W. Argonne National Lab., IL (United States). Oct 1993. 20p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR 91-20000. (CONF-930710–4: Physics and chemistry of molecular and oxide superconductors, Eugene, OR (United States), 27-31 Jul 1993). Order Number DE94001456. Source: OSTI; NTIS; GPO Dep.

We present measurements of the uniaxial pressure dependence of Tc of untwinned $YBa_2Cu_3O_7$-δ crystals with various oxygen stoichiometries. For all samples investigated, Tc decreases for pressure along a, increases for pressure along b and, in oxygen deficient samples, increases strongly for pressure along c. These results are compared to the behavior found in the $La_{2-x}Sr_xCuO_4$ and $YBa_2Cu_4O_8$ systems. Neither the model of pressure induced charge transfer nor coupling to orthorhombic distortions can explain all the data. However, presence of singularities in electronic density of states close to Fermi energy is a possible origin of the observed behavior. Preliminary data on pressure dependence of c-axis and in-plane resistivities in twinned crystals are consistent with this view.

1078 (ANL/MSD/PP–75442) **A Brillouin scattering investigation of NIO.** Grimsditch, M. (Argonne National Lab., IL (United States)); Kumar, S.; Goldman, R.S. Argonne National Lab., IL (United States). Jun 1992. 18p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract N00014-88-K-0331. Order Number DE93040977. Source: OSTI; NTIS; GPO Dep.

Brillouin scattering from single crystals of NiO show that apart from the expected phonon peaks, there is a broad central peak. The phonon peaks have Fano-like line-shapes indicating a strong coupling between them and the broad feature, and lead to elastic constants that differ considerably from ultrasonic values. The broad feature is probably 'magnetic' in origin since it disappears at the Neel temperature. We speculate that it may be the lower of the two AFMR modes predicted for easy-plane antiferromagnets but which has previously been observed only in EuTe and MnO. The interaction between the phonons and the 'magnetic' excitation provides a phenomenological explanation for the differences in the elastic constants determined by different techniques.

1079 (CONF-9304191–3) **High-$T_c$superconducting superlattices.** Wood, R.F. Oak Ridge National Lab., TN (United States). Jun 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on high-T_c superconductivity and its applications; Cairo (Egypt); 4-16 Apr 1993. Order Number DE93019200. Source: OSTI; NTIS; GPO Dep.

Superlattices composed of $YBa_2CU_3O_7$ and $PrBa_2Cu_3O_7$ have been studied extensively experimentally and several theoretical attempts to correlate the resistivity as a function of temperature with the superlattice structure have appeared in the literature. The theoretical interest in such structures comes about primarily because of insight into dimensionality effects, interlayer coupling, and interlayer charge redistribution in high-T_c, superconductors. On the experimental side, there are possibilities for device applications that are just now beginning to be explored. After an overview of the experimental work and a discussion of charge transfer calculations, a description of how the experimental data can be explained using a model that incorporates Kosterlitz-Thouless (vortex-antivortex unbinding) and Azlamazov-Larkin (fluctuation-enhanced conductivity) theories in the resistive transition region and charge-transfer effects, variable-range hopping, etc. in the normal state. Difficulty in disentangling charge transfer and dimensionality effects in determining the nominal transition temperature is pointed out and other mechanisms that influence the width of the resistive transition are considered.

1080 (CONF-9308122–8) **Effect of powder characteristics on gas-pressure sintering of Si_3N_4 with rare earth additives.** Tiegs, T.N.; Nunn, S.D.; Walls, C.A.; Barker, D.; Davisson, C.; Jones, P.J. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International Union of Materials Research Societies on advanced materials; Tokyo (Japan); 31 Aug - 4 sep 1993. Order Number DE94000330. Source: OSTI; NTIS; GPO Dep.

Several Si_3N_4 powders, synthesized by various methods and having different surface areas, oxygen contents and impurity levels, were examined. During early stage densification, all powders showed similar shrinkage with the diimide ederived powder exhibiting delayed α/β transformation compared to the other powders. The diimide and gas-phase derived powders achieved the highest final densities. Improved densification was observed by increasing the oxygen content and this also resulted in high toughness for some materials with rare earth apatite additives. However, the increased oxygen resulted in reduced high temperature strength. Fracture toughnesses (K_{Ic}) up to 10 $MPa\sqrt{m}$ were obtained for some compositions.

1081 (CONF-9308122–9) **Low temperature diffusion of hydrogenic species in oxide crystals: Radiation induced diffusion.** Chen, Y. (Oak Ridge National Lab., TN (United States)); Gonzalez, R. Oak Ridge National Lab., TN (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States); Comision Interministerial de Ciencia y Tecnologia (Spain). DOE Contract AC05-84OR21400. From International Union of Materials Research Societies on advanced materials; Tokyo (Japan); 31 Aug - 4 sep 1993. Order Number DE94000374. Source: OSTI; NTIS; GPO Dep.

Normally stable configurations of substitutional protons or deuterons in oxide crystal become highly unstable during ionizing radiation at room temperature, resulting in the displacements of these species. The cross section for radiation-induced-displacements of protons is exceedingly large and is a strong function of temperature. The displacement cross section of protons from cation sites is twice that of deuterons. Diffusion of these species can be induced at temperatures not otherwise possible by thermal means. For example, using electron irradiation near room temperature the O-H bond is readily broken and the hydrogenic species can be channeled along the c-axis in TiO_2 by an applied electric field. Radiation induced displacements of protons from anion sites (hydride ions) at room temperature are also discussed.

1082 (DOE/CE/90052–T1) **Thin-wall hollow ceramic spheres from slurries: Quarterly project status report, 1 January–31 March 1991.** Chapman, A.T.; Cochran, J.K. Georgia Inst. of Tech., Atlanta, GA (United States). School of Material Engineering. [1991]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC05-89CE90052. Order Number DE94000746. Source: OSTI; NTIS; GPO Dep.

The hollow sphere materials were alumina, mullite, and mullite-ZrO_2 (the Zr reduced the high-temperature thermal conductivity). During this phase, three major tasks were emphasized: Use of opacifiers (Zr oxide) to reduce the high-temperature thermal conductivity of the sphere, convert the slurries from organic-based to aqueous-based, and technology transfer to industry.

1083 (DOE/ER/45428–T1) **[Scanning tunnelling microscopy and spectroscopy of ceramic grain boundaries]: [Annual report, September 1992–September 1993].** Pennsylvania State Univ., University Park, PA (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER45428. Order Number DE94001441. Source: OSTI; NTIS; GPO Dep.

Objective is to study the local geometric and electronic structure at grain boundaries in oxides; this was motivated by the potential to use STM and tunneling spectroscopy on semiconducting ceramics. In order to understand the imaging of low conductivity materials, a number of transition metal oxides were examined: ZnO, TiO_2. Spatial resolution limits are considered. Conductance profiles across silicon grain boundaries are compared with those across more complex $SrTiO_3$ grain boundaries. Calculations of space charge in complex oxides are presented. A SEM/STM was constructed which operates in ultrahigh vacuum and has large scale positioning capability (> 1 cm).

1084 (DOE/OR/21411–T2) **Properties of yttria-tetragonal zirconia polycrystal (Y-TZP) materials after long-term exposure to elevated temperatures: Final report.** Swab, J.J. (Army Materials Research Agency, Watertown, MA (United States). Materials Technology Lab.). Army Materials Research Agency, Watertown, MA (United States). Materials Technology Lab. Mar 1989. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-84OR21411. (MTL-TR–89-21). Order Number DE93019599. Source: OSTI; NTIS; GPO Dep.

Seven commercially available yttria-tetragonal zirconia polycrystal (Y-TZP) materials were evaluated. Room temperature properties were measured before and after heat treatments at 1000C. Microstructure and phase stability were also examined. In all but one case, the Y-TZPs showed very little change in room temperature properties after long times at this temperature. Results show that pressure-assisted processing greatly improves the strength by reducing porosity and keeping the grain size extremely fine, but this reduces the toughness because finer grains are more difficult to transform. In addition, a small amount of cubic zirconia appears to enhance the toughness of fine-grained Y-TZP while maintaining good strength. During processing, a small amount of cubic zirconia is formed and allowed to grow. This creates regions poor in yttria which can transform spontaneously in the presence of a crack-tip stress field.

1085 (DOE/PC/91309–T9) **High temperature alkali corrosion of ceramics in coal gas: Eighth quarterly progress report, June 1, 1993–September 1, 1993.** Pickrell, G.R.; Sun, T.; Brown, J.J. Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Center for Advanced Ceramic Materials. 24 Aug 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91309. Order Number DE94001966. Source: OSTI; NTIS; GPO Dep.

Gaseous alkali corrosion kinetics of Si_3N_4 were investigated from 950 to 1100°C in an atmosphere containing 0.98 vol % sodium nitrate vapors. Linear reaction rates from 950 to 1100°C indicate that the alkali reaction Of Si_3N_4 is interface-controlled with an activation energy of 199 kJ/mol. Rate controlling step of overall reaction appears to be the oxidation of Si_3N_4 to SiO_2.An alkali reaction mechanism, involving a complex dissolution-oxidation process, was proposed. The difference between oxidation of Si_3N_4 in air and reaction of Si_3N_4 in presence of alkali is dissolution process of SiO_2 in sodium silicate liquid. Gaseous alkali corrosion kinetics of alumina were also investigated at 1100 and 1150°C. The reaction thickness is linearly related to the reaction time, suggesting an interface-controlled reaction mechanism. The reaction rate constants are 0.24 μm/h and 0.45 μm/h at 1100 and 1150°C. The alumina grains seemed to be preferentially attacked along certain crystallographic directions. Subsolidus phase relations in the Na_2O-Al_2O_3-TiO_2 system were also studied. Phase analysis indicates that the Na_2O-Al_2TiO_5 section is not a true binary system. A revised phase diagram was constructed.

1086 (ENEA-RT-ERG–93-09) **Electrical conductivity of electrolytic matrix for molten carbonate fuel cell.** Giorgi, L. (ENEA, Casaccia (Italy). Area Energetica); Simonetti, E.; Pozio, A. ENEA, Casaccia (Italy). Area Energetica. May 1993. 33p. (RT/ERG–93-09). Order Number DE94716604. Source: OSTI; NTIS (US Sales Only).

An overview of the electrical conductivity of molten salts and in particular of the molten alkaline carbonates is presented. The interaction of different alkali metals on the equivalent conductivity is discussed together to the migration mechanisms and salt mixtures structure. The aim of the experimental work was to study the electrical conductivity of the electrolytic matrix used in the molten carbonate fuel cell (MCFC) and to set-up a methodology to obtain the true value for this parameter. For this purpose a laboratory scale cell was used in different experimental conditions and with electrolytic matrix having different compositions. An analysis of the error sources in the determination of conductivity was performed and a methodology based on the electrochemical impedance spectroscopy was setupped. The results of the measurements show that the conductivity follows an Arrhenius type equation as a function of the temperature, but the relationship is the same used for electrolytic aqueous solution. The conduction mechanism is more complicated because the molten carbonates have a mixed structure ranging from that of electrolytic solution to that of a ionic solids. No influence of the gas composition on the conductivity values was found; that means the concentrations of oxygen species (O^{2-}, O_2^{2-}, O_2^-) is very low. It is necessary to use high frequencies (>20 kHz) to measure the electrolytic matrix resistance, otherwise the error could be higher then 10%. The lower activation energies are achieved with the higher carbonates/ceramic ratio in the electrolytic matrix; that was explained considering the not conductive nature of the $LiAlO_2$ ceramic and the distribution of the molten salts on its surface.

1087 (INIS-BR–3148, pp. 71-74) **Polymer-ceramic piezoelectric composites (PZT).** Bassora, L.A. (Sao Carlos Univ., SP (Brazil). Dept. de Fisica); Eiras, J.A. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo,

SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Polymer-ceramic piezoelectric transducers, with 1-3 of connectivity were prepared with different concentration of ceramic material. Piezoelectric composites, with equal electromechanical coupling factor and acoustic impedance of one third from that ceramic transducer, were obtained when the fractionary volume of PZT reach 30%. (C.G.C.).

1088 (IS-M–753) **Evaluation of $A_5Si_3Z_x$ intermetallics for use as high temperature structural materials.** Kim, Y.; Thom, A.J.; Meyer, M.K.; Akinc, M. Ames Lab., IA (United States). [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931009–3: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials in conjunction with materials week and the Materials Applications and Services Exposition, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE93041127. Source: OSTI; NTIS; GPO Dep.

Refractory intermetallic silicides are receiving increasing consideration for use as high temperature structural materials. A_5Si_3 compositions are particularly interesting due to their ability to incorporate a variety of interstitial ternary additions. These ternary additions present a unique opportunity to potentially tailor physical properties. Previous experimental work has shown that these additions can decrease the inherent thermal expansion anisotropy of Ti_5Si_3. This paper reviews some of the literature with respect to binary and ternary silicides of the form $A_5Si_3Z_x$. Recent experimental work by the authors on two promising compositions, Ti_5Si_3 and Mo_5Si_3, is discussed. Interstitial additions substantially improve the isothermal oxidation resistance of both Ti_5Si_3 and Mo_5Si_3. The lattice parameter of Ti_5Si_3 is significantly changed by ternary interstitial additions, indicating the extensive solubility of Ti_5Si_3 for such additions. The level of similar additions affects the phase assemblage of Mo_5Si_3. Hardness and toughness values from indentation measurements for selected compositions are given.

1089 (IS-M–766) **Melt-spin processing of high T_c oxide superconductors.** Folkerts, T.J.; Wu, Hengning; Yoo, S.I.; Merkle, B.D.; Arrasmith, S.R.; Dennis, K.W.; Kramer, M.J.; McCallum, R.W. Iowa State Univ. of Science and Technology, Ames, IA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82 ;FG02-90ER45427. (CONF-9302103–6: 122. annual meeting of the Minerals, Metals and Materials Society (TMS), Denver, CO (United States), 21-25 Feb 1993). Order Number DE94000696. Source: OSTI; NTIS; GPO Dep.

Containerless techniques offer distinct advantages for the melt processing of oxide superconductors. The majority of these materials form liquids which are highly reactive with standard crucible materials such as Al_2O_3 and Pt, resulting in non-negligible contamination. We have developed a containerless melt-spin processing technique where in 50–400 μm particles of $REBa_2Cu_3O_{7-x}$ high temperature oxide superconductors are melted in free fall through a vertical tube furnace and quenched onto a copper wheel. Previously this method has been successful in producing glasses of $NdBa_2Cu_3O_{7-x}$ and $GdBa_2Cu_3O_{7-x}$. In this report we discuss the results for both stoichiometric and non-stoichiometric $YBa_2Cu_3O_{7-x}$ (Y123). Thermal, microstructural, and superconducting characterization of both the as-quenched and the annealed materials will be presented.

1090 (IS-M–771) **A numerical analysis of crack propagation in microcracking ceramic and ceramic composites.** Biner, S.B. Ames Lab., IA (United States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931142–1: 1. meeting of the Pacific Rim ceramic societies, Honolulu, HI (United States), 7-10 Nov 1993). Order Number DE94001192. Source: OSTI; NTIS; GPO Dep.

A set of numerical analyses of crack growth was performed to elucidate the mechanism of microcracking on the observed fracture behavior of ceramics and ceramic composites. The random nucleation, orientation and size effects of discrete microcracks and resulting interactions are fully accounted for in a hybrid finite element model. The results indicate that the energy expenditure due the microcrack nucleation seems not to contribute significantly to the resistance to crack growth. The main controlling parameter appears to be elastic interaction of the microcracks with the main crack in the absence of a reinforcing phase; therefore, the microcrack density plays an important role. In the case of the composites, the interaction of the main crack with the stress fields of the reinforcing phase, rather than interaction of microcracks, is the controlling parameter for the resistance to the crack growth even in the presence of a large population of microcracks. It will be also shown that the crack branching and crack kinking can readily develop as a result of microcracking.

1091 (IS-T–1665) **The incongruent melting and melt textured solidification process of $Bi_2Sr_2CaCu_2O_8$.** Polonka, J. Iowa State Univ. of Science and Technology, Ames, IA (United States). 1993. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE93041123. Source: OSTI; NTIS; GPO Dep.

The melting and solidification was studied using in-situ high temperature XRD from melting point to 900°C in 0.2, 0.1, 0.02 atm O_2 and pure N_2. The incongruent melting point of $Bi_2Sr_2CaCu_2O_8$ was lowered by decreasing the partial O_2 pressure from 870C (in .2 atm O_2) to 830C (in pure N_2 atmosphere). As temperature was increased the incongruent melting of $Bi_2Sr_2CaCu_2O_8$ followed a phase sequence in which (Ca, Sr)CuO_2 → (Ca, Sr)CuO_2 → (Ca,Sr)O occur in presence of Bi-rich liquid. At 900C, the only crystalline phase present in the melt was (Ca,Sr)O. This phase sequence remained the same for all four different partial O_2 pressures. During the solidification of $Bi_2Sr_2CaCu_2O_8$, from 10C below the melting point to 760C, the major phases that form depend on the partial O_2 pressure. As partial O_2 pressures was lowered from 0.2 to 0 atm, the major second phase formation out of the melt follows the sequence of (Ca, Sr)CuO_2 → (Ca, Sr)CuO_2 → (Ca,Sr)O respectively. At 0.1 Atm partial O_2 pressure and below, $Bi_2Sr_2CaCu_2O_8$ solidified out of the melt; at 0.2 atm of O_2 $Bi_2Sr_2CaCu_2O_6$ forms instead.

1092 (LA-UR–93-2821) **Outermost atomic layer on antifluoritic Li_2O(111).** Ellis, W.P. (Los Alamos National Lab., NM (United States)); Bastasz, R.; Shindo, I. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308154–1: 4. international conference on the structure of surfaces, Shanghai (China), 16-19 Aug 1993). Order Number DE93040261. Source: OSTI; NTIS; GPO Dep.

The fluorite crystal structure is based on CaF_2 in which Ca^{++} cations are at the centers of alternating cubes of the F^- simple cubic anion array. Crystal symmetry is determined by the face-centered cubic Ca^{++} lattice. Surfaces of this material as well as the analogous fluoritic dioxide UO_2 have been studied and in both cases the surfaces terminate with the anion. Antifluoritic Li_2O is isostructural with the fluorite lattice but exactly reversed from it in the number and positions occupied by anions and cations. In Li_2O where Li^+ is simple cubic and $O^=$ is fcc, the Li_2O cleavage face poses an interesting comparison to previous studies of fluorites: Is the outermost layer Li^+ as required by long-range forces, crystal symmetry and charge neutrality, or is it $O^=$ for other reasons? We present evidence that the outer layer indeed is Li^+ as determined by angle-resolved low-energy ion-scattering (LEIS) spectroscopy combined with LEED/Auger analysis.

1093 (LA-UR–93-2879) **Local structure in oxygen-doped $La_2CuO_{4+\delta}$.** Hammel, P.C. (Los Alamos National Lab., NM (United States)); Reyes, A.P.; Ahrens, E.T.; MacLaughlin, D.E.; Thompson, J.D.; Fisk, Z.; Canfield, P.C.; Cheong, S.W.; Schirber, J.E. Los Alamos National Lab., NM (United States); Sandia National Labs., Albuquerque, NM (United States). 4 Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930865–7: International conference on strongly correlated electron systems, La Jolla, CA (United States), 16-19

Aug 1993). Order Number DE93040248. Source: OSTI; NTIS; GPO Dep.

Oxygen doped $La_2CuO_{4+\delta}$, due to the unusually large mobility of the oxygen ions at high temperatures, is the only cuprate which has macroscopic phase separation of doped holes. We discuss our studies of $La_2CuO_{4+\delta}$, including phase separation, distributed local structure whose onset coincides with-phase separation and the observation that in the presence of doped holes two distinct copper sites copper sites are generated, an observation which contrasts with results of diffraction studies. The superconducting transition temperature Tc in this material changes by over 10% in response to altered cooling history. Below a temperature T_t, the situation becomes similar to other cuprates since oxygen is no longer sufficiently mobile to allow further macroscopic phase separation. In this regime the magnetic behavior of metallic $La_2CuO_{4+\delta}$ is conventional in context of cuprates. However ^{139}La NMR spectroscopy has shown the local structure of the La-O layer to be very sensitive to the presence of doped holes and to be strongly temperature dependent in this same regime. This sensitivity is evident in the CuO_2 planes where, in the presence of doped holes a second, distinct copper site is present. This provides an opportunity to explore the relationship between local structure and the novel magnetic behavior of the cuprates.

1094 (LA-UR–93-2942) **Vaporization behavior of non-stoichiometric refractory carbide materials and direct observations of the vapor phase using laser diagnostics.** Butt, D.P.; Wantuck, P.J.; Rehse, S.J.; Wallace, T.C. Sr. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308163–1: North Atlantic Treaty Organization (NATO) advanced research workshop on corrosion of advanced ceramics, Tubingen (Germany), 30 Aug - 3 sep 1993). Order Number DE93040094. Source: OSTI; NTIS; GPO Dep.

Transition metal and actinide carbides, such as ZrC or NbC and UC or ThC, exhibit a wide range of stoichiometry, and therefore vaporize incongruently. At long times, steady state vaporization can be achieved where relative concentrations of atomic species on solid surface equals that in the gas phase. The surface composition under these steady state conditions is termed the congruently vaporizing composition, (CVC). Modeling the vaporization or corrosion behavior of this dynamic process is complex and requires an understanding of how the surface composition changes with time and a knowledge of CVC, which is both temperature and atmosphere dependent. This paper describes vaporization and corrosion behavior of non-stoichiometric refractory carbide materials and, as an example, describes a thermokinetic model that characterizes the vaporization behavior of the complex carbide $U_xZr_{1-x}C_y$ in hydrogen at 2500 to 3200 K. This model demonstrates that steady state corrosion of $U_xZr_{1-x}C_y$ is rate limited by gaseous transport of Zr where partial pressure of Zr is determined by CVC. This paper also briefly describes efforts to image and characterize the vapor phase above the surface of ZrC in static and flowing gas environments using planar laser induced fluorescence. We have developed the method for monitoring and controlling the corrosion behavior of nuclear fuels in nuclear thermal rockets. However, the techniques described can be used, to image boundary layers, and could be used verifying corrosion models.

1095 (LA-UR–93-3060) **Synthesis of (U,Zr)C solid solutions under exothermic conditions.** Wang, L.L.; Moore, H.G.; Gladson, J.W. Los Alamos National Lab., NM (United States). 20 Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940101–3: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE93040190. Source: OSTI; NTIS; INIS; GPO Dep.

The reactions of forming (U,Zr)C solid solutions from their elemental components or similarly less stable reactants such as UC_2 are strongly exothermic due to the high stability of these solid solutions. A simple approach of utilizing this heat of formation energy to assist the solid solution reaction process is to intimately mix the less stable reactant powders and then pressed them into a compact. The compact is then heated to the ignition temperature of the reaction. The feasibility of this reaction method to synthesize (U,Zr)C solid solutions has been demonstrated in this study. The preliminary results also show that both the initial composition and the heating rate have a significant effect on the nature of the reaction process. As expected the degree of powder mixing was also found to affect the completeness of the reaction.

1096 (LA-UR–93-3144) **Anomalous magnetoresistance behavior of superconducting $Nd_{2-x}Ce_xCuO_{4-y}$ single crystal.** de Andrade, M.C. (California Univ., San Diego, La Jolla, CA (United States)); Dalichaouch, Y.; Maple, M.B. Los Alamos National Lab., NM (United States). 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308173–2: International conference on strongly correlated electronic systems, San Diego, CA (United States), 15-19 Aug 1993). Order Number DE94000806. Source: OSTI; NTIS; GPO Dep.

Magnetoresistance measurements on a superconducting $Nd_{2-x}Ce_xCuO_{4-y}$ single crystal with $T_c \approx 7$ K were made with magnetic fields H applied parallel (H || c) and perpendicular (H $\perp$ c) to the tetragonal c-axis. For H || c, the resistive superconductive transition curves exhibit a double transition at low temperatures and high magnetic fields. This double resistive transition has a maximum near T $\approx$ 1.1 K, followed by an extremely sharp transition into the superconducting state. For applied fields of 1kOe, the resistivity first goes to zero, increases again to a finite value and then goes through a second transition. In this region, the resistivity exhibits non-ohmic behavior for low current densities and ohmic behavior for larger measuring currents. The resistivity for H $\perp$ c does not exhibit any anomalous behavior or a maximum for $0 \leq H \leq 60$ kOe and $4 \leq T \leq 7$ K.

1097 (LA-UR–93-3189) **Discontinuous phase formation and selective attack of SiC materials exposed to low oxygen partial pressure environments.** Butt, D.P. (Los Alamos National Lab., NM (United States)); Tressler, R.E.; Spear, K.E. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States); Gas Research Inst., Chicago, IL (United States). DOE Contract W-7405-ENG-36. Contract 5084-238-1302. (CONF-9308163–2: North Atlantic Treaty Organization (NATO) advanced research workshop on corrosion of advanced ceramics, Tubingen (Germany), 30 Aug - 3 sep 1993). Order Number DE93040161. Source: OSTI; NTIS; GPO Dep.

Three SiC materials were exposed to gas mixtures containing N_2, H_2, and CO at 1000-1300C, 1-740 torr for a few to 1000 h. Kinetic and thermodynamic studies indicate that CO is the predominant oxidizing species. A variety of corrosion processes were observed, including surface and internal pit formation, needle growth, grain boundary attack, and attack of impurities and surrounding material. In the case of a siliconized SiC, impurities such as Ca, Al, and Fe diffused rapidly through the Si matrix forming complex calcium aluminosilicates on the surface, leaving behind internal voids. Evaluation of the mechanical properties, including fractography, revealed a variety of degradative phenomena. Efforts to identify causes of pit formation suggested that the overall process was complex. Pits formed during attack of grain boundaries and regions containing transition metal impurities. Studies of single crystals showed preferential attack near impurities and crystalline defects, indicating that damaged crystals or certain crystal orientations in the polycrystalline materials are susceptible to attack. In addition, under some conditions where pit formation was observed, the strength of certain materials increased apparently due to flaw healing. It is suggested that flaws can heal in the absence of mechanical stress due to their high surface energy. However, second phases observed within partially healed surface cracks suggest impurities also contribute to the flaw healing processes.

1098 (LBL–34523) **Specific heat of $YBa_2Cu_3O_7$.** Phillips, N.E. (Lawrence Berkeley Lab., CA (United States)); Emerson, J.P.; Fisher, R.A.; Woodfield, B.F.; Wright, D.A.; Gordon, J.E. Lawrence Berkeley Lab., CA (United States). Aug 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930710–2: Physics and chemistry of molecular and oxide superconductors, Eugene, OR (United States), 27-31 Jul 1993). Order Number DE93040640. Source: OSTI; NTIS; GPO Dep.

Specific heat measurements, including measurements in magnetic fields and at both low temperatures and near T_c, on a number of $YBa_2Cu_3O_7$ samples have revealed several correlations among strongly sample dependent parameters. These correlations suggest that the sample dependence of the parameters reflects a sample dependence of the volume fraction of superconductivity, which is in turn correlated with a low concentration of Cu^{2+} moments. The correlations give a criterion for recognizing the value of the parameters characteristic of the fully superconducting material. Preliminary results on effects of sample heat treatment are reported. New data on the "linear term" is presented and discussed.

1099 (ORNL/Sub–86-SE793C) **Fabrication of whisker-toughened alumina tubes: Final report.** Loutfy, R.O. (Materials and Electrochemical Research Corp., Tucson, AZ (United States)). Oak Ridge National Lab., TN (United States); Materials and Electrochemical Research Corp., Tucson, AZ (United States). Sep 1993. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001012. Source: OSTI; NTIS; GPO Dep.

A process has been developed to fabricate whisker toughened alumina composites by slip casting dense colloidal suspensions of Al_2O_3-15% SiC_w. Optimum processing parameters for slip casting we developed with slip viscosity of 60–70 centipoise and solids content 78–79 wt %. Slip-cast parts with green densities 65 to 68% theoretical were achieved. Composite parts were pressureless sintered to 96–97% theoretical density with <1% open porosity. The composites exhibited strengths of 500 MPa, toughness of 6.5 MPa $m^{1/2}$, and hardness of 17.26 GPa (1765 kg/mm^2). High temperature strength retention was maintained up to 1200C. Good thermal shock resistance with ΔT_{cr} = 500C was also achieved. The process technology was transferred into pilot scale for producing prototype heat exchanger tubing up to 4 inches in diameter at the facilities of Vesuvius/McDanel.

1100 (ORNL/TM–12423) **An assessment of the cost of microwave sintering ceramic tiles for armor applications: Phase 1.** Das, S.; Curlee, T.R. Oak Ridge National Lab., TN (United States). Sep 1993. 32p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94000978. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The sintering component of a process cost model was used to estimate the cost of microwave sintering alumina and Si carbide tiles. While the process cost model focuses only on cost of the sintering step, preliminary estimates of total cost of a microwave-sintered tile are also provided, assuming that costs of pre- and post-sintering steps will not be altered by adoption of microwave sintering. Base-case cost of microwave sintering alumina tiles is estimated to be $14.98 and $18.17/part for 2.45 and 28 GHz microwave power sources. Cost of microwave sintering is >3× the cost of conventional sintering, but microwave sintering is not expected to drastically increase the cost of ceramic tiles; the increase factor is only 1.3×. For Si carbide tiles, the base-case cost of microwave sintering is lower than that of conventional sintering ($39.11 and $41.66/part for 2.45 and 28 GHz sources vs $106.14/part for conventional sintering). Labor is one of the largest sintering cost components in the case of alumina tiles, while for Si carbide tiles, materials is the largest sintering cost component. Sensitivity analysis indicate that costs are particularly sensitive to changes in quantity of microwave energy required (kWh/lb) during sintering.

1101 (SAND–93-0610) **Dynamic properties of ceramic materials.** Grady, D.E.; Wise, J.L. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000654. Source: OSTI; NTIS; GPO Dep.

Controlled impact methods have been employed to obtain dynamic response properties of armor materials. Experimental data have been obtained for high-strength ceramics. Continued analysis of time-resolved velocity interferometer measurements has produced systematic material-property data for Hugoniot and release response, initial and post-yield strength, pressure-induced phase transformation, and dynamic fracture strength. A new technique has been developed to measure hydrodynamic properties of ceramic through shock-wave experiments on metal-ceramic composites and data obtained for silicon carbide. Additional data on several titanium diboride ceramics and high-quality aluminum oxide ceramic have been acquired, and issues regarding the influence of microstructure on dynamic properties have emerged. Comparison of dynamic (Hugoniot elastic limit) strength and indentation hardness data has been performed and important correlations revealed. Innovative impact experiments on confined and unconfined alumina rods using axial and transverse VISAR diagnostics have been demonstrated which permit acquisition of multiaxial dynamic response data. Dynamic failure properties of a high-density aluminosilicate glass, similar in composition to the intergranular glassy phase of some aluminas, have been investigated with regard to yield, spall, and failure-wave propagation.

1102 (SAND–93-1979C) **NMR studies of oxygen-doped $La_2CuO_{4+\delta}$.** Hammel, P.C. (Los Alamos National Lab., NM (United States)); Reyes, A.P.; Ahrens, E.T.; MacLaughlin, D.E.; Thompson, J.D.; Fisk, Z.; Canfield, P.C.; Cheong, S.W.; Schirber, J.E. Sandia National Labs., Albuquerque, NM (United States); Los Alamos National Lab., NM (United States). 11 Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (LA-UR–93-2879;CONF-9308173–1: Internaticnal conference on strongly correlated electronic systems, San Diego, CA (United States), 15-19 Aug 1993). Order Number DE93040756. Source: OSTI; NTIS; GPO Dep.

The observation that the structure of this material is sensitive to levels of doping sufficient to produce superconductivity (T_c~40 K) suggests an important role for structure in determining its electronic properties. Here we discuss unusual features of phase separation and studies of cooling rate dependence of the superconducting $T_c$relevant to this proposition.

1103 (UCRL-CR–114189) **Gas-pressure forming of superplastic ceramic sheet.** Nieh, T.G.; Wadsworth, J. Lawrence Livermore National Lab., CA (United States). 24 Jun 1993. 4p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. Contract DAAL03-89-C-0028. Order Number DE94001520. Source: OSTI; NTIS; GPO Dep.

Superplasticity in ceramics has now advanced to the stage that technologically viable superplastic deformation processing can be performed. In this paper, examples of biaxial gas-pressure forming of several ceramics are given. These include yttria stabilized, tetragonal zirconia (YTZP) a 20% alumina/YTZP composite, and silicon. In addition, the concurrent superplastic forming and diffusion bonding of a hybrid YTZP/C103 (ceramic-metal) structure are presented. These forming processes offer technological advantages of greater dimensional control and increased variety and complexity of shapes than is possible with conventional ceramic shaping technology.

1104 (UCRL-JC–112045) **Positron annihilation study of Sr Doping in $La_{2-x}Sr_xCuO_4$.** Sterne, P.A. (Lawrence Livermore National Lab., CA (United States)); Howell, R.H.; Fluss, M.J.; Kaiser, J.H.; Kitazawa, K.; Kojima, H. Lawrence Livermore National Lab., CA (United States). 22 Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Grant Y-1135. (CONF-930367–10: Conference on spectroscopies in novel superconductors, Santa Fe, NM (United States), 17-19 Mar 1993). Order Number DE94000307. Source: OSTI; NTIS; GPO Dep.

We present a combined experimental and threshold study of effects of Sr doping on electronic structure of $La_{2-x}Sr_xCuO_4$. Electron-positron momentum distributions have been measured to high statistical precision (> 4 × 10^8 counts) at room temperature for samples with Sr concentrations of x = 0.0, 0.1, 0.13 and 0.2. Analysis of all four spectra reveal strong features due to electron-positron wavefunction overlap, in quantitative agreement with theoretical calculations. The Sr doped samples show discontinuities consistent with presence of a Fermi surface. The form and position of these features are in general agreement with the predictions of band theory. Correspondence between theory and experiment, as well as some differences, are revealed by a detailed study of the

changes in electron-position momentum density with increasing Sr doping.

1105 (UCRL-JC–112108) **The effect of microstructural evolution on superplasticity in $Ni_3Si(V,Mo)$.** Stoner, S.L. (Lawrence Livermore National Lab., CA (United States)); Mukherjee, A.K. Lawrence Livermore National Lab., CA (United States). Oct 1992. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9211268–1: Advances in superplasticity and superplastic forming, Chicago, IL (United States), 1-5 Nov 1992). Order Number DE93041320. Source: OSTI; NTIS; GPO Dep.

To further the understanding of superplasticity in intermetallics, this paper presents results of experimental investigations on an intermetallic alloy based on nickel silicide. Specifically, the evolution of the microstructure and its influence on superplastic performance is discussed. In the duplex microstructure, one phase showed grain growth, and the other, grain refinement. Cavitation occurred at interphase boundaries and final failure was by interlinkage of these cavities. Annealing the material improved the homogeneity of the microstructure. The annealed material showed improved strain rate sensitivity values and enhanced superplasticity. Microstructural features and ductility were also influenced by changing the orientation of the tensile axis. Though a transverse orientation showed more cavitation than longitudinal, it yielded greater elongation. An increased resistance to cavity coalescence in the transverse direction played a role in the enhanced ductility.

1106 (UCRL-JC–113299) **High pressure Hugoniot of sapphire.** Erskine, D. Lawrence Livermore National Lab., CA (United States). Jul 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–59: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001048. Source: OSTI; NTIS; GPO Dep.

The Hugoniot of sapphire was measured from 80 GPa to 340 GPa in shock-wave experiments using projectiles accelerated by a two stage gas gun. Transit times of the shock waves were measured either optically with a streak camera or through electrical pin contacts. The Hugoniot in this pressure range fits U_s=8.74+0.96 $U_p$in km/s.

1107 (UCRL-JC–113378) **Dielectric properties and electronic applications of aerogels.** Hrubesh, L.W.; Pekala, R.W. Lawrence Livermore National Lab., CA (United States). Jul 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308158–2: International symposium on advances in sol-gel processing and applications, Chicago, IL (United States), 27-28 Aug 1993). Order Number DE94001543. Source: OSTI; NTIS; GPO Dep.

Among their other exceptional properties, aerogels also exhibits unusual dielectric properties due to their nano-sized structures and high porosities. For example, our measurements of the dielectric constants and loss tangents for several aerogel varieties at microwave frequencies show that they both vary linearly with the aerogel density, indicating that the dielectric behavior of aerogels is more gas-like than solid-like. We have also measured the dielectric strength of silica aerogels and find that they are better than ceramics for high voltage insulation. The low dielectric constants and loss tangents of aerogels, along with their controllable thermal expansion properties, make them desirable materials for use as thin films in high speed integrated digital and microwave circuitry.

3606 Other Materials

Refer also to citation(s) 247, 293, 320, 329, 330, 342, 368, 556, 558, 561, 563, 564, 987, 1010, 1024, 1040, 1090, 1103, 1217, 1230, 1256, 1453, 1615, 1812, 2029, 2328, 2570, 2581, 2597

1108 (ANL/CHM/CP–80106) **Fullerene derivatives and fullerene superconductors.** Wang, H.H.; Schlueter, J.A.; Cooper, A.C. Argonne National Lab., IL (United States). [1993]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9307123–1: U.S./Japan seminar on physics and chemistry of C_{60} and related compounds, Honolulu, HI (United States), 10-23 Jul 1993). Order Number DE93019568. Source: OSTI; NTIS; INIS; GPO Dep.

A series of 1:1 C_{60} Cycloaddition adducts, C_{60}A (A = anthracene, butadiene, cyclopentadiene, and methylcyclopentadiene), has been synthesized. The products are cleanly separated and characterized by use of TGA, 1H-NMR, IR, and mass spectrometry. Among these adducts, C_{60}(methylcyclopentadiene) showed the highest thermal stability and was doped with three equivalents of rubidium. The resulting Rb_3C_{60}(MeCp) is a semiconductor but can be thermally converted to the superconducting Rb_3C_{60} through a retro-Diels-Alder reaction. A one-step doping process to prepare Rb_3C_{60} crystals has been developed. The optimal doping condition occurs at ~ 300°C. High superconducting shielding fractions between 60 and 90% and sharp transition widths (ΔT_{10--90} between 4 and 0.7 K) were measured for these samples.

1109 (ANL/ET/CP–78614) **Thermomechanical processing of Ag-clad $Bi_2Sr_2CaCu_2O_x$ superconductors.** Wu, C.T.; Goretta, K.C.; Lanagan, M.T.; Biondo, A.C.; Poeppel, R.B. Argonne National Lab., IL (United States). Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931009–8: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE94002347. Source: OSTI; NTIS; INIS; GPO Dep.

$Bi_2Sr_2CaCu_2O_x$ (2212) powders were synthesized by solid-state reaction, loaded into Ag tubes, and processed into tapes by various combinations of drawing, rolling, and heat treatment. Critical current densities at 4.2 K of greater than 10^5 A/cm^2 were achieved from microstructures consisting of large, highly textured 2212 grains. Optimal microstructures were produced by specific mechanical-working conditions and heat-treatment schedules that incorporated solid-state and partial-melt sintering. The relationships between processing, microstructure, and critical current density will be discussed.

1110 (ANL/IPNS/CP–79847) **The structure and spin dynamics of lanthanide-bearing silicate glasses.** Ellison, A.J.G.; Loong, C.K.; Wagner, J. Argonne National Lab., IL (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931133–4: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE94001320. Source: OSTI; NTIS; GPO Dep.

Structures of $3Na_2O{\cdot}R_2O_3{\cdot}6SiO_2$ (R = Nd, Yb and Lu) glasses were studied by time-of-flight neutron diffraction. Average Si-O and O-O nearest-neighbor coordination is found to be similar to SiO_4 tetrahedral units in vitreous SiO_2 and other silicate glasses. The RE ions coordinate with no more than 7 nearest-neighbor oxygen atoms. The dynamic and static response of these glasses and their isochemical crystalline analogs have been investigated by inelastic neutron scattering and magnetic susceptibility measurements. The magnetic excitation spectra were analyzed by a ligand-field model using a method of descending symmetry. Correlation between short-range atomic order in a network glass and magnetic interactions of the RE ions with the local environment is discussed.

1111 (ANL/MSD/CP–78506) **The elastic and electromechanical properties of $BaTiO_3$ single crystal through the ferroelectric transition.** Li, Z.; Grimsditch, M.; Chan, S.K. Argonne National Lab., IL (United States). Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930852–3: 8. international meeting on ferroelectricity, Gaithersburg, MD (United States), 8-13 Aug 1993). Order Number DE94001437. Source: OSTI; NTIS; INIS; GPO Dep.

Using Brillouin scattering and impedance methods, the elastic, piezoelectric and dielectric properties have been determined for monodomain single crystal $BaTiO_3$ from 23 to 160C. In the cubic phase (T> 130C) only the compressional elastic constant C_{11} exhibits partial softening of about 6% upon cooling. During the tetragonal to cubic phase transition, most elastic constants sow discontinuous changes; either stiffening or softening. These and other results are discussed in terms of precursive effects through the electromechanical interaction of the ferroelectric phase transformation.

1112 (ANL/MSD/CP–79238) **MOCVD growth and structure of $PbTiO_3$ thin films.** Gao, Y. (New Mexico Inst. of Mining and Technology, Socorro, NM (United States). Dept. of Materials Engineering); Bai, G.; Merkle, K.L.; Chang, H.L.M.; Lam, D.J. Argonne National Lab., IL (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930405–39: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE93040230. Source: OSTI; NTIS; GPO Dep.

$PbTiO_3$ thin films grown on (001)MgO and (110)MgO by MOCVD have been characterized by x-ray diffraction and transmission electron microscopy. The $PbTiO_3$ films deposited on (001)MgO under the optimum conditions always show a bi-layer structure. The top layer of the films near the free surface is c-axis oriented with the orientation relationship (001)[100]$PbTiO_3$||(001)[100]MgO. The bottom layer of the films near the substrate is a-axis oriented with (100)[001]$PbTiO_3$||(001)[100]MgO. 90° domains were observed, but only in the c-axis oriented layers. The thickness of the a-axis oriented layers near the substrate decreases with decreasing the cooling rate. $PbTiO_3$ films deposited on (110) MgO, however, are single-layer, epitaxial films with (101)[001]$PbTiO_3$||(110)[001]MgO.

1113 (ANL/MSD/CP–79440) **Tensile strength of fiber reinforced plastics at 77K irradiated by various radiation sources.** Humer, K. (Atominstitut der Oesterreichischen Universitaeten, Vienna (Austria)); Weber, H.W.; Tschegg, E.K.; Egusa, S.; Birtcher, R.C.; Gerstenberg, H. Argonne National Lab., IL (United States). Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States); Bundesministerium fuer Wissenschaft und Forschung, Vienna (Austria). DOE Contract W-31109-ENG-38. (CONF-930928–5: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE93040826. Source: OSTI; NTIS; INIS; GPO Dep.

The influence of radiation damage on the mechanical properties of fiber reinforced plastics (FRPs), which are considered as candidate materials for the insulation of superconducting magnets for nuclear fusion reactors, has been investigated. Different types of FRPs (epoxies, bismaleimides; two- and three-dimensional reinforcement structures with E-, S-, or T-glass fibers) has been included in the test program. Three aspects of our present results will be discussed in detail. The first is related to an assessment of the tensile strength and its radiation dependence under the influence of strongly varying radiation conditions. The second aspect refers to low temperature (≈5 K) reactor irradiation of selected materials. In this case, identical sets of tensile test samples were transferred into the tensile testing machine, one without warming-up to room temperature and the other after an annealing cycle to room temperature. Finally, a comparison between the radiation response of different materials is made. It turns out that the three-dimensionally reinforced bismaleimide shows the smallest degradation of its tensile properties under all irradiation conditions.

1114 (ANL/RE/CP–80143) **Topic 5: Time-Dependent Behavior.** Pfeiffer, P.A. (Argonne National Lab., IL (United States)); Tanabe, Tada-aki. Argonne National Lab., IL (United States). [1991]. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9106436–1: U.S. symposium on rock mechanics, Norman, OK (United States), Jun 1991). Order Number DE93017450. Source: OSTI; NTIS; INIS; GPO Dep.

This chapter is a report of the material presented at the International Workshop on Finite Element Analysis of Reinforced Concrete, Session 4 – Time Dependent Behavior, held at Columbia University, New York on June 3–6, 1991. Dr. P.A. Pfeiffer presented recent developments in time-dependent behavior of concrete and Professor T. Tanabe presented a review of research in Japan on time-dependent behavior of concrete. The chapter discusses the recent research of time-dependent behavior of concrete in the past few years in both the USA-European and Japanese communities. The author appreciates the valuable information provided by Zdenek P. Bazant in preparing the USA-European Research section.

1115 (CONF-9211267–1) **Cement-aggregate compatibility and structure property relationships including modelling.** Jennings, H.M.; Xi, Y. Northwestern Univ., Evanston, IL (United States). 15 Jul 1993. 31p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract FG02-91ER45460. Grant DMR-8808432-01. From 9. international congress of the chemistry of cement; New Delhi (India); 23-28 Nov 1992. Order Number DE93040835. Source: OSTI; NTIS; GPO Dep.

The role of aggregate, and its interface with cement paste, is discussed with a view toward establishing models that relate structure to properties. Both short (nm) and long (mm) range structure must be considered. The short range structure of the interface depends not only on the physical distribution of the various phases, but also on moisture content and reactivity of aggregate. Changes that occur on drying, i.e. shrinkage, may alter the structure which, in turn, feeds back to alter further drying and shrinkage. The interaction is dynamic, even without further hydration of cement paste, and the dynamic characteristic must be considered in order to fully understand and model its contribution to properties. Microstructure and properties are two subjects which have been pursued somewhat separately. This review discusses both disciplines with a view toward finding common research goals in the future. Finally, comment is made on possible chemical reactions which may occur between aggregate and cement paste.

1116 (CONF-9308122–6) **Lattice damage during ion implantation of semiconductors.** Haynes, T.E. Oak Ridge National Lab., TN (United States). Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International Union of Materials Research Societies on advanced materials; Tokyo (Japan); 31 Aug - 4 sep 1993. Order Number DE94000335. Source: OSTI; NTIS; INIS; GPO Dep.

The temperature dependence of the lattice damage created during ion implantation of Si, Ge, Si-Ge alloys, and various III-V compounds is reviewed and interpreted in terms of a transition between two different damage formation mechanisms. Implications of this transition for control of damage, annealing, and electrical activation are discussed, particularly in GaAs.

1117 (CONF-9309242–1) **Microstructurally based mechanisms for modeling shrinkage of cement paste at multiple levels.** Jennings, H.M.; Xi, Yunping. Northwestern Univ., Evanston, IL (United States). 15 Jul 1993. 20p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract FG02-91ER45460. Grant DMR-8808432-01. From 5. international symposium on creep and shrinkage of concrete; Barcelona (Spain); 6-9 Sep 1993. Order Number DE93040836. Source: OSTI; NTIS; GPO Dep.

Shrinkage of cement paste is controlled by a number of mechanisms that operate in various parts of the microstructure and at various length scales. A model for creep and shrinkage can be developed by combining several models that describe phenomena at each of several length scales, ranging from the nanometer to the meter. This model is described and preliminary results are discussed.

1118 (DOE/MC/27224–93/C0199) **DSRP, Direct Sulfur Production.** Gangwal, S.K. (Research Triangle Inst., Research Triangle Park, NC (United States)); McMichael, W.J.; Agarwal, S.K.; Jang, B.L.; Howe, G.B.; Chen, D.H.; Hopper, J.R. Research Triangle Inst., Research Triangle Park, NC (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27224. (CONF-9306148–4: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019292. Source: OSTI; NTIS; GPO Dep.

Hot-gas desulfurization processes for IGCC and other advanced power applications utilize regenerable mixed-metal oxide sorbents to remove hydrogen sulfide (H_2S) from raw coal gas. Regeneration of these sorbents produces an off-gas typically containing I to 3 percent sulfur dioxide (SO_2). Production of elemental sulfur is a highly desirable option for the ultimate disposal of the SO_2 content of this off-gas. Elemental sulfur, an essential industrial commodity, is easily stored and transported. As shown in Figure 1, the DSRP consists of two catalytic reactors, each followed by a sulfur condenser. Hot regenerator off-gas is mixed with a hot coal-gas slip stream and fed to the first DSRP reactor. Approximately 95 percent of the sulfur gas in the inlet stream of the first reactor is converted

to elemental sulfur. The outlet gas of the first DSRP reactor is cooled, condensing out sulfur. The gas could be recycled after the Stage I condenser. Alteratively, by adjusting the proportion of coal gas to regenerator off-gas, the effluent composition of the first reactor can be controlled to produce an H_2S-to-SO_2 ratio of 2 to 1 at 95 percent sulfur conversion. The cooled gas stream is then passed to the second DSRP reactor where 80 to 90 percent of the remaining sulfur compounds are converted to elemental sulfur via the modified Claus reaction at high pressure. The total efficiency of the two reactors for the conversion of sulfur compounds to elemental sulfur is projected to be about 99.5 percent.

1119 (DOE/OR/00033–T553) **Evaluation of wavelength shifters for spectral separation of barium fluoride emissions.** DeVol, T.A. (Michigan Univ., Ann Arbor, MI (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Michigan Univ., Ann Arbor, MI (United States). 1993. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033 ;FG02-86NE37969. Order Number DE94000847. Source: OSTI; NTIS; GPO Dep.

BaF_2 has the advantage over other scintillators, when comparing radiation hardness, scintillation decay time, and fast scintillation yield. Since the fast BaF_2 emissions have peak wavelengths of 220, 195, and 170 nm, a wavelength shifter (WLS) is needed. Organic fluors were evaluated as WLS components. Results indicate that spectral separation using WLS is possible, but not to the extent desired; other techniques must be used also. Alternative scintillators, such as CeF_3, should be investigated.

1120 (ETDE-IT–93-244) **Effect of substrate roughness on porous silicon light emission.** Di Francia, G. (ENEA, Portici (Italy). Centro Ricerche Fotovoltaiche); Menna, P.; Falconieri, M. 1993. 13p. (CONF-9305296–: Light emission from silicon, Strasbourg (France), 4-7 May 1993). Order Number DE94716596. Source: OSTI; NTIS (US Sales Only).

Porous silicon layers fabricated on substrates of different roughness are studied. The photoluminescence characteristics of these samples are reported at room and liquid nitrogen temperature. The initial roughness of the substrates regulates the porous silicon formation mechanism. The results are explained in terms of the quantum confinement model. The rougher is the starting substrate, the narrower is the size distribution of the emitting structures.

1121 (INIS-mf–13731, pp. 343) **Comparative studies of polymer materials as radon protection coatings.** Espinosa, G. (Inst. de Fisica, Mexico, D.F. (Mexico)); Golzarri, J.I.; Gammage, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYMERS/building materials; POLYMERS/coatings; RADON/radiation protection; COMPARATIVE EVALUATIONS; PARTICLE TRACKS; PERMEABILITY; POLYMERS; COATINGS; RADON

1122 (INIS-mf–13731, pp. 378) **On the adherence of the uranium to the walls of the solution vessels.** Danis, A. (Inst. of Physics and Nuclear Engineering, Bucharest (Romania)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CONTAINERS/adsorption; URANIUM/adsorption; URANIUM/particle tracks; ADHESION; CONTAINERS; ADSORPTION; GLASS; POLYETHYLENES; RADIOCOLLOIDS; SOLUTIONS; URANIUM

1123 (IS-M–763) **New extensions in the development of deformation processed metal-metal matrix composites.** Ellis, T.W.; Gibson, E.D. Ames Lab., IA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931103–3: Joint MMIJ/TMS international conference on processing materials for properties, Honolulu, HI (United States), 7-10 Nov 1993). Order Number DE94000692. Source: OSTI; NTIS; GPO Dep.

Copper-Refractory metal composites have been under development for some time. The experience gained with these materials has been used as a starting point for investigations into other alloy systems. Deformation processing for the production of metal-metal matrix composites has been applied to titanium-yttrium, yttrium-niobium, copper-cobalt, aluminum-niobium and magnesium-refractory metal alloys. This process has been used to produce elevated strength material and also for the production of electrical capacitors.

1124 (IS-M–768) **Creep deformation characteristics of ductile discontinuous fiber reinforced composites.** Biner, S.B. Ames Lab., IA (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931009–4: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials in conjunction with materials week and the Materials Applications and Services Exposition, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE94000697. Source: OSTI; NTIS; GPO Dep.

Role of material parameters and geometric parameters of ductile reinforcing phase on the creep deformation behavior of 20% discontinuously reinforced composite was numerically investigated including debonding and pull-out mechanisms. Results indicate that for rigidly bonded interfaces, the creep rate of the composite is not significantly influenced by the material properties and geometric parameters of the ductile reinforcing phase due to development of large hydrostatic stress and constrained deformation in the reinforcement. For debonding interfaces, the geometric parameters of the reinforcing phase are important; however, event with very weak interfacial behavior low composite creep rates can be achieved by suitable selection of the geometric parameters of the ductile reinforcing phase.

1125 (LA–12673-C) **JOWOG 28 main meeting.** Sandoval, C.W. (comp.). Los Alamos National Lab., NM (United States). Sep 1993. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309236–Absts.: JOWOG 28 meeting, Los Alamos, NM (United States), 27-30 Sep 1993). Order Number DE93041117. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document consists of abstracts from presented papers at the September 1993 JOWOG A/B meeting. Various aspects of materials research are presented. Composite materials and environmentally conscious manufacturing are first reported. Then under the umbrella topic of Organic Materials the following subjects are examined: foams, thermoset studies, replacement activities, adhesives, and MDA replacement. Subjects that were discussed under the topic of inorganic materials include: Salt and lithium, processing, and glass/ceramics.

1126 (LBL–34278) **Implantation of carbon in GaAs and compensating native defects.** Moll, A.J.; Ager, J.W. III; Yu, K.M.; Walukiewicz, W.; Haller, E.E. Lawrence Berkeley Lab., CA (United States). Jul 1993. 8p. Sponsored by USDOE, Washington, DC (United States); Intel Foundation (United States). DOE Contract AC03-76SF00098. (CONF-9307124–2: 17. international conference on defects in semiconductors, Gmunden (Austria), 18-23 Jul 1993). Order Number DE93040122. Source: OSTI; NTIS; GPO Dep.

The effects of co-implantation on the electrical activity of C acceptors have been studied using a series of elements as co-implants. A variety of electrical and structural techniques were used for characterization. It is found that although co-implantation with heavy ions improves the substitutionally of C atoms on As sites, a high electrical activity of the C_{As} acceptors is attained only if the stoichiometry is maintained through co-implantation of group III atoms.

1127 (LBL–34280) **Physics with chemically and isotopically pure semiconductors.** Haller, E.E. Lawrence Berkeley Lab., CA (United States). May 1993. 26p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract

AC03-76SF00098. Contract W17605. (CONF-9305280–1: JA-SOWIEC '93, Warsaw (Poland), 24-28 May 1993). Order Number DE93040120. Source: OSTI; NTIS; GPO Dep.

Chemically and isotopically pure semiconductors offer a wealth of interesting physics. We review a number of impurity complexes which were discovered in ultrapure Germanium. The have led the way to the widely pursued studies of hydrogen in numerous semiconductors. Isotope related effects and processes include neutron transmutation doping, a technique used for a number of silicon and germanium devices. Isotopically pure and deliberately mixed crystals of germanium have been grown recently and have been used to study the dependence of the indirect bandgap and phonon properties on the mass and mass disorder of the nuclei. The large number of stable isotopes of the various semiconductors present a great potential for basic and applied studies. Semi-conductor isotope engineering may become a reality because of the new economic and political world order.

1128 (LBL–34395) **Hydrogen in compound semiconductors.** Haller, E.E. Lawrence Berkeley Lab., CA (United States). May 1993. 10p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC03-76SF00098. Contract F49620-91-C-0082. (CONF-9307139–1: 12. record of alloy semiconductor physics and electronics symposium, Izunagaoka (Japan), 14-16 Jul 1993). Order Number DE93040300. Source: OSTI; NTIS; GPO Dep.

Progress in the understanding of hydrogen and its interactions in III/V and II/VI compound semiconductors is reviewed. Donor, acceptor and deep level passivation is well established in III/V compounds based on electrical measurements and on spectroscopic studies. The hydrogen donor levels in GaAs and GaP are estimated to lie near E_v+0.5 eV and E_v+0.3 eV, respectively. Arsenic acceptors have been passivated by hydrogen in CdTe and the very first nitrogen-hydrogen local vibrational model spectra in ZnSe have been reported. This long awaited result may lead to an explanation for the poor activation of nitrogen acceptors in ZnSe grown by techniques which involve high concentrations of hydrogen.

1129 (LUFTD2-TFFF–0038-1-155) **Studies on deep electronic levels in silicon and aluminium gallium arsenide alloys.** Pettersson, H. Lund Univ. (Sweden). Dept. of Solid State Physics. 1993. 158p. Order Number DE94605430. Source: OSTI; NTIS; INIS.

This thesis reports on investigations of the electrical and optical properties of deep impurity centers, related to the transition metals (TMs) Ti, Mo, W, V and Ni, in silicon. Emission rates, capture cross sections and photoionization cross sections for these impurities were determined by means of various Junction Space Charge Techniques (JSCTs), such as Deep Level Transient Spectroscopy (DLTS), dark capacitance transient and photo capacitance transient techniques. Changes in Gibbs free energy as a function of temperature were calculated for all levels. From this temperature dependence, the changes in enthalpy and entropy involved in the electron and hole transitions were deduced. The influence of high electric fields on the electronic levels in chalcogen-doped silicon were investigated using the dark capacitance transient technique. The enhancement of the electron emission from the deep centers indicated a more complex field enhancement model than the expected Poole-Frenkel effect for coulombic potentials. The possibility to determine charge states of defects using the Poole-Frenkel effect, as often suggested, is therefore questioned. The observation of a persistent decrease of the dark conductivity due to illumination in simplified AlGaAs/GaAs high Electron Mobility Transistors (HEMTs) over the temperature range 170K<T<300K is reported. A model for this peculiar behavior, based on the recombination of electrons in the two-dimensional electron gas (2DEG) located at the AlGaAs/GaAs interface with holes generated by a two-step excitation process via the deep EL2 center in the GaAs epilayer, is put forward.

1130 (ORNL/Sub–87-00184/04) **Development of silicon nitride composites with continuous fiber reinforcement.** Starr, T.L. (Georgia Inst. of Tech., Atlanta, GA (United States). Georgia Technology Research Inst.); Mohr, D.L.; Lackey, W.J.; Hanigofsky, J.A. Oak Ridge National Lab., TN (United States); Georgia Inst. of Tech., Atlanta, GA (United States). Georgia Technology Research Inst. Oct 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001996. Source: OSTI; NTIS; GPO Dep.

The composites were fabricated using ultrafine Si powders prepared by attritor milling; the powders exhibits full conversion to Si nitride in < 3 h at ≤ 1200 C (these conditions reduce degradation of the fibers compared to conventional). Effects of processing conditions on fiber properties and the use of fiber coatings to improve stability during processing as well as change the fiber-matrix interfacial properties were investigated. A duplex carbon-silicon carbide coating, deposited by CVD, reduced fiber degradation in processing, and it modified the fiber-matrix adhesion. Si nitride matrix composites were fabricated using reaction sintering, forming laminates, filament-wound plates, and tubes. In each case, an attritor milled Si powder slurry is infiltrated into ceramic fiber preforms or tows, which are then assembled to form a 3-D structure for reaction sintering. The resulting composites have properties comparable to chemical vapor infiltration densified composites, with reasonable strengths and graceful composite fracture behavior.

1131 (PNL–7732) **Irradiation testing of an asphalt-based grout vault sealant.** Bunnell, L.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000543. Source: OSTI; NTIS; INIS; GPO Dep.

In general, Nokorode 705M (a) showed only minimal effects from irradiation at the levels calculated for a 300-year lifetime, while in contact with the basic fluids expected in actual use. In no instance was loss of adhesion on concrete or loss of water tightness encountered in this testing. In contrast to simpler materials tested over 30 years ago, the Nokorode showed only small changes in density and virtually no changes in the mechanical properties examined. The much higher dose rate used to perform these tests within a reasonable time presumably amplified all irradiation effects, and nevertheless produced no changes which would make the material obviously unsuitable for its intended use. Although the effects observed were not examined in enough detail to determine the dominant degradation mechanism(s), the material is qualified from an engineering point of view.

1132 (SAND–93-0547C) **Photo-induced and electrooptic properties of (Pb,La)(Zr,Ti) O_3 films for optical memories.** Dimos, D.; Potter, B.G.; Sinclair, M.B.; Tuttle, B.A.; Warren, W.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9304197–2: International symposium on integrated ferroelectrics, Colorado Springs, CO (United States), 19-21 Apr 1993). Order Number DE93019820. Source: OSTI; NTIS; GPO Dep.

Photo-induced hysteresis changes and electrooptic effects in sol-gel $Pb(Zr,Ti)0_3$ (PZT) and PLZT films have been studied in an effort to evaluate these materials for optical memory applications. The films exhibit two types of photo-induced changes in their hysteresis behavior which are suitable for optical storage. Both types of photo-induced hysteresis changes are due to trapping of photogenerated charge carriers at sites which minimize internal depolarizing fields. The photo-induced changes are reproducible and stable, which indicates that the charge traps are stable. However, improvements in photosensitivity will be required to develop a competitive technology for optical memories. In addition, polarization-dependent changes in the refractive indices can be the basis of a nondestructive optical readout technique. The index changes of films have been determined using a waveguide refractometry technique, which allows the extraordinary and ordinary index changes to be obtained independently.

1133 (SAND–93-0998C) **Techniques for producing free-standing thin films on frames.** Aubert, J.H.; McNamara, W.F. Sandia National Labs., Albuquerque, NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9305283–1: 9. target fabrication specialists meeting, Monterey, CA (United States), 9 May 1993). Order Number DE93041144. Source: OSTI; NTIS; GPO Dep.

The procedures of vapor-deposition polymerization, spin coating and orientation-dependent etching have been employed to make

free-standing thin films of Parylene-N, Parylene-D, polystyrene, polycarbonate and perfluoro-dimethyl-dioxole/tetrafluoroethylene copolymer (Teflon® AF-1600). The polymeric materials were vapor-deposited or spin-coated onto substrates of polished single-crystal silicon (wafers) and removed on frames of various shapes and sizes after application of adhesive and an etching process using potassium hydroxide. Thicknesses range from 2000Å to 12000Å.

1134 (SAND–93-1107C) **Ultraviolet photosulfidation of III-V compound semiconductors for electronic passivation.** Zavadil, K.R.; Ashby, C.I.H.; Howard, A.J.; Hammons, B.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9311104–2: 40. national symposium of the American Vacuum Society (AVS), Orlando, FL (United States), 15-19 Nov 1993). Order Number DE94001417. Source: OSTI; NTIS; GPO Dep.

A new vacuum-compatible passivation technique for III-V compound semiconductors has been developed. Sulfur passivation of GaAs(100) is produced by ultraviolet photolytic deposition of a sulfide species from vapor phase elemental sulfur. Photoluminescence studies of the photosulfided GaAs reveal a degree of passivation greater than or equal to that produced by conventional ($NH_4$2S) solution treatment. X-ray Photoelectron Spectroscopy has shown that the sulfur resides on the surface as a single reduced sulfur species, either as sulfide of disulfide, indicating complete fragmentation of the S_8 ring by UV light in proximity to the surface. The degree of photosulfidation depends strongly on surface preparation as demonstrated by the described surface oxide removal studies.

1135 (SAND–93-1287) **Continuum representations of cellular solids.** Neilsen, M.K. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001706. Source: OSTI; NTIS; GPO Dep.

Cellular materials consist of interconnected struts or plates which form cells. The struts or plates are constructed from a variety of metals, polymers, ceramics and wood products. Cellular materials are often used in impact limiters for shipping containers to protect the contents from accidental impact events. These materials exhibit a variety of complex behavior when subjected to crushing loads. This research focuses on the development of continuum representations of cellular solids that can be used in the finite element analysis of shipping container accidents. A significant portion of this work is the development of a new methodology to relate localized deformations to appropriate constitutive descriptions. This methodology provides the insight needed to select constitutive descriptions for cellular solids that capture the localized deformations that are observed experimentally. Constitutive relations are developed for two different cellular materials, aluminum honeycomb and polyurethane foam. These constitutive relations are based on plasticity and continuum damage theories. Plasticity is used to describe the permanent deformation exhibited by both aluminum honeycomb and polyurethane foam. Continuum damage is needed to capture the change in elastic parameters due to cracking of the polyurethane cell wall materials. The new constitutive description of polyurethane foam is implemented in both static and dynamic finite element codes, and analytical and numerical predictions are compared with available experimental data.

1136 (SAND–93-1856C) **Optimization of an electron cyclotron resonance plasma etch process for n^+ polysilicon: HBr process chemistry.** Tipton, G.D. (Sandia National Labs., Albuquerque, NM (United States)); Blain, M.G.; Westerfield, P.L.; Trutna, L.S.; Maxwell, K.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308162–1: 2. workshop on high density plasmas and their applications, San Francisco, CA (United States), 5-6 Aug 1993). Order Number DE93019077. Source: OSTI; NTIS; GPO Dep.

Designed experiments were employed to characterize a process for etching phosphorus doped polycrystalline silicon with HBr in a close-coupled ECR plasma reactor configured for 200 mm wafers. A fractional factorial screening experiment was employed to determine the principal input factors and the main etch effects. Linear models of the process responses indicate RF power, O_2 flow rate, and the position of the resonance zone (with respect to the wafer) as the three strongest factors influencing process performance. Response surfaces generated using data from a follow-on response surface methodology (RSM) experiment predicted an optimum operating region characterized by relatively low RF power, a small O_2 flow, and a resonance zone position close to the wafer. The optimized process demonstrated a polysilicon etch rate of 270 nm/min, an etch rate non-uniformity of 2.2% (1s), an etch selectivity to oxide greater than 100:1, and anisotropic profiles. Particle test results for the optimized process indicated that careful selection of the O_2 fraction is required to avoid polymer deposition and particle formation.

1137 (UCRL-ID–112774) **Fabrication Technology.** Blaedel, K.L. Lawrence Livermore National Lab., CA (United States). Mar 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94003017. Source: OSTI; NTIS; GPO Dep.

The mission of the Fabrication Technology thrust area is to have an adequate base of manufacturing technology, not necessarily resident at Lawrence Livermore National Laboratory (LLNL), to conduct the future business of LLNL. The specific goals continue to be to (1) develop an understanding of fundamental fabrication processes; (2) construct general purpose process models that will have wide applicability; (3) document findings and models in journals; (4) transfer technology to LLNL programs, industry, and colleagues; and (5) develop continuing relationships with the industrial and academic communities to advance the collective understanding of fabrication processes. The strategy to ensure success is changing. For technologies in which they are expert and which will continue to be of future importance to LLNL, they can often attract outside resources both to maintain their expertise by applying it to a specific problem and to help fund further development. A popular vehicle to fund such work is the Cooperative Research and Development Agreement with industry. For technologies needing development because of their future critical importance and in which they are not expert, they use internal funding sources. These latter are the topics of the thrust area. Three FY-92 funded projects are discussed in this section. Each project clearly moves the Fabrication Technology thrust area towards the goals outlined above. They have also continued their membership in the North Carolina State University Precision Engineering Center, a multidisciplinary research and graduate program established to provide the new technologies needed by high-technology institutions in the US. As members, they have access to and use of the results of their research projects, many of which parallel the precision engineering efforts at LLNL.

1138 (UCRL-JC–111960) **Fabrication of amorphous diamond films.** Falabella, S.; Boercker, D.B.; Sanders, D.M. Lawrence Livermore National Lab., CA (United States). Apr 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930419–5: International conference on metallurgical coatings and thin films, San Diego, CA (United States), 19-23 Apr 1993). Order Number DE94000404. Source: OSTI; NTIS; GPO Dep.

Amorphous diamond (a:D) is a hard, electrically insulating, inert and transparent form of carbon that has the sp^3 bond character of crystalline diamond, but lacks a long-range ordered structure. Using our filtered cathodic arc system, we have produced a:D films at room temperature that demonstrate hardness above 8000 H_v, hydrogen content below 0.1%, density of 2.7 $\pm$ 0.3 g/cc, and adhesion on tungsten carbide and silicon substrates above 10 kpsi. The fine structure of a:D was characterized by TEM and electron diffraction. TEM showed no evidence of any ordered structure down to 1 run. Unlike natural diamond or DLC, a:D has a flat transmission spectrum from 0.8 to over 50 which is due to its amorphous nature and the lack of hydrogen. Also, we determined the index of refraction of our a:D to be 2.47–2.57. The thermal diffusivity of a:D has been measured and reported for the first time. We have lowered the intrinsic stress in the films by the use of bias and the inclusion of impurity atoms, and produced films up to 8 gm thick on carbide tool bits. In addition, a molecular dynamics code has been used to model this material.

1139 (UCRL-JC–111969-Rev.1) **The optical constants and spectral specular reflectivity of highly oriented pyrolytic graphite (HOPG): Revision 1.** Havstad, M.A.; Schildbach, M.A.; McLean, W. II. Lawrence Livermore National Lab., CA (United States). Aug 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930830–11-Rev.1: National conference and exposition on heat transfer, Atlanta, GA (United States), 8-11 Aug 1993). Order Number DE93040546. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of the specular reflectivity and the optical constants of highly ordered pyrolytic graphite (HOPG) have been made using two independent optical systems. The first measures reflectance (at 1.06 μm and 293 K) by comparing the intensity of a laser beam before and after reflecting off the sample. The second determines the complex index of raft-action (from 0.55 to 8.45 μm, with sample temperatures of 293, 480, 900 and 1300 K) by ellipsometry. Agreement between the two methods is good. Moderate reflectivities are observed over the full spectral range of measurement: the spectral directional-hemispherical reflectivity at normal incidence varies from 0.41 at 0.55 μm to 0.74 at 8.45 μm. The components of the complex index of refraction increase smoothly with wavelength. The index of refraction increases from 3.10 at 0.55 μm to 7.84 at 8.45 μm. The extinction coefficient varies from 2.01 to 6.66 over the same range.

1140 (UCRL-JC–113403) **Theoretical phase diagrams for solid H_2.** Surh, M.P.; Runge, K.J. Lawrence Livermore National Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–58: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001049. Source: OSTI; NTIS; GPO Dep.

Possible phase diagrams for solid molecular para-hydrogen in the 0-200 GPa pressure regime are constructed on the basis of ab initio calculations. Structures for the broken symmetry phase (BSP) and H-A phase have recently been proposed under the assumption that the molecules are centered on sites of a hexagonal close-packed lattice with the ideal c/a ratio, i.e., only molecular orientational and electronic changes are allowed. Symmetry considerations then dictate the simplest phase diagrams consistent with experimental observations, although the possibility of additional transitions cannot be ruled out. A simple model is introduced to describe the BSP and H-A transitions.

1141 (UCRL-JC–113794) **Superplasticity in ceramic and metal matrix composites and the role of grain size, segregation, interfaces, and second phase morphology.** Wadsworth, J.; Nieh, T.G. Lawrence Livermore National Lab., CA (United States). Oct 1992. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9210400–1: Grain boundary and interface phenomena workshop, Berkeley, CA (United States), 16-21 Oct 1992). Order Number DE93019938. Source: OSTI; NTIS; GPO Dep.

Structural ceramics and ceramic composites have been shown to exhibit superplasticity in recent times and this discovery has attracted tremendous interest. Although the number of ceramics exhibits superplasticity is now quite large, there are gaps in understanding the requirements for superplasticity in ceramics. Also, superplastic behavior at very high strain rates (1 s^{-1}) in metallic-based materials is an area of increasing research. In this case, the phenomenon has been observed quite extensively in aluminum alloy-based metal matrix composites and mechanically alloyed aluminum- and nickel-based materials. Again, the details of the structural requirements of this phenomenon are not yet understood. In the present paper, experimental results on superplasticity in ceramic-based materials and on high strain rate behavior in metallic-based materials are presented. The roles of grain size, grain boundary and interface chemistry, and second phase morphology and compatibility with the matrix material will be emphasized.

1142 (UCRL-JC–113806) **Poroelasticity of rock.** Bonner, B.P. (Lawrence Livermore National Lab., CA (United States)); Berge, P.A.; Berryman, J.G.; Wang, H.F. Lawrence Livermore National Lab., CA (United States). 13 May 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305275–1: Office of Basic Energy Sciences (BES) workshop on rock fracture, Albuquerque, NM (United States), 13-14 May 1993). Order Number DE93040209. Source: OSTI; NTIS; GPO Dep.

Poroelasticity is the theoretical framework used to describe the coupled processes which occur when a fluid bearing porous material is deformed by a stress field. The theoretical basis for the treatment of problems in poroelasticity has been derived in an extensive body of work over the last fifty years, most notably by Biot. Many of Biot's successors have attempted to find relationships between the physical properties of the material to be analyzed and the Biot coefficients. Our approach to this problem has both theoretical and experimental components. The general theoretical objective is to produce estimates of the Biot coefficients which are more realistic e.g.. are not limited by assumptions which preclude their use for real earth materials. Experiments are designed to measure the coefficients (or parameters which are directly related to them) which have not been measured as yet to provide new insight for improving the theory of poroelasticity. The experimental program is designed to determine the mechanical and transport properties of a well characterized set of synthetic and natural sandstones from static to ultrasonic frequencies.

1143 (UCRL-JC–114192) **Carbon aerogels: An update on structure, properties, and applications.** Pekala, R.W.; Mayer, S.T.; Kaschmitter, J.L.; Kong, F.M. Lawrence Livermore National Lab., CA (United States). Jul 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308158–3: International symposium on advances in sol-gel processing and applications, Chicago, IL (United States), 27-28 Aug 1993). Order Number DE94001528. Source: OSTI; NTIS; GPO Dep.

Aerogels are unique porous materials whose composition, structure, and properties can be controlled at the nanometer scale. This paper examines the synthesis of organic aerogels and their carbonized derivatives. Carbon aerogels have low electrical resistivity, high surface area, and a tunable pore size. These materials are finding applications as electrodes in double layer capacitors.

1144 (UCRL-LR–114182) **Two-point correlation functions to characterize microgeometry and estimate permeabilities of synthetic and natural sandstones.** Blair, S.C.; Berge, P.A.; Berryman, J.G. Lawrence Livermore National Lab., CA (United States). Aug 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93019878. Source: OSTI; NTIS; GPO Dep.

We have developed an image-processing method for characterizing the microstructure of rock and other porous materials, and for providing a quantitative means for understanding the dependence of physical properties on the pore structure. This method is based upon the statistical properties of the microgeometry as observed in scanning electron micrograph (SEM) images of cross sections of porous materials. The method utilizes a simple statistical function, called the spatial correlation function, which can be used to predict bounds on permeability and other physical properties. We obtain estimates of the porosity and specific surface area of the material from the two-point correlation function. The specific surface area can be related to the permeability of porous materials using a Kozeny-Carman relation, and we show that the specific surface area measured on images of sandstones is consistent with the specific surface area used in a simple flow model for computation of permeability. In this paper, we discuss the two-point spatial correlation function and its use in characterizing microstructure features such as pore and grain sizes. We present estimates of permeabilities found using SEM images of several different synthetic and natural sandstones. Comparison of the estimates to laboratory measurements shows good agreement. Finally, we briefly discuss extension of this technique to two-phase flow.

1145 (Y/DV–1276) **Low toxicity aromatic diamine curing agents for adhesives.** Dorsey, G.F. Oak Ridge Y-12 Plant, TN (United States). 24 Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400.

(CONF-9308150–10: Environmentally conscious manufacturing congress '93, Arlington, VA (United States), 30 Aug - 1 sep 1993). Order Number DE94001946. Source: OSTI; NTIS; GPO Dep.

Increasing severity of regulations for handling of hazardous materials has led to formulation of adhesives with considerably lowered toxicities for use at the Oak Ridge Y-12 Plant. Fundamental was the development of Asilamine aromatic diamines, a family of liquid aromatic diamines useful as substitutes for methylenedianiline (MDA), a widely used adhesives curing agent. The use of Asilamine has allowed us to continue operations without dealing with expensive measures for regulation of MDA as a carcinogen promulgated by the Occupational Safety and Health Administration (OSHA).

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Refer also to citation(s) 828, 2276, 2891

1146 (INIS-mf–13442) **The fifty fifth annual meeting of the Israel Chemical Society.** Israel Chemical Society, Tel-Aviv (Israel). 1990. 134p. (CONF-9002221–: 55. National conference of the Israel chemical society, Tel-Aviv (Israel), 11-12 Feb 1990). Order Number DE93616001. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

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Refer also to citation(s) 8, 180, 183, 208, 210, 211, 216, 302, 304, 440, 479, 515, 756, 807, 884, 925, 1005, 1008, 1034, 1083, 1255, 1297, 1304, 1319, 1327, 1330, 1354, 1452, 1612, 1822, 1828, 1841, 1847, 1905, 2009, 2010, 2011, 2012, 2043, 2418

1147 (ANL/CHM/CP–79025) **Actinide phosphonate complexes in aqueous solutions.** Nash, K.L. Argonne National Lab., IL (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930905–13: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94001347. Source: OSTI; NTIS; INIS; GPO Dep.

Complexes formed by actinides with carboxylic acids, polycarboxylic acids, and aminopolycarboxylic acids play a central role in both the basic and process chemistry of the actinides. Recent studies of f-element complexes with phosphonic acid ligands indicate that new ligands incorporating doubly ionizable phosphonate groups ($-PO_3H_2$) have many properties which are unique chemically, and promise more efficient separation processes for waste cleanup and environmental restoration. Simple diphosphonate ligands form much stronger complexes than isostructural carboxylates, often exhibiting higher solubility as well. In this manuscript recent studies of the thermodynamics and kinetics of f-element complexation by 1,1 and 1,2 diphosphonic acid ligands are described.

1148 (ANL/CMT/CP–79185) **Solvent characterization using the dispersion number.** Leonard, R.A. Argonne National Lab., IL (United States). 6 Oct 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931043–1: 8. symposium on separation science and technology for energy applications, Knoxville, TN (United States), 17-21 Oct 1993). Order Number DE94002365. Source: OSTI; NTIS; GPO Dep.

When developing new solvent extraction processes, one often has to evaluate new solvents, new aqueous phases, or both for their ability to work in plant-scale equipment. To facilitate solvent characterization, a simple test is proposed based on the dimensionless dispersion number (N_{Di}). It allows one to characterize the ability of the solvent to separate from a two-phase dispersion and allows one to estimate process throughput for equipment of a given size. Several ways to carry out the N_{Di} test are given, including a standard test procedure. The N_{Di} test was applied to the performance of solvent extraction equipment with discrete process stages, the leaching of plasticizers from plastic tubing, and the development of a new solvent for the combined extraction of strontium and transuranic elements.

1149 (BARC–1993/P/003) **Spectroscopy Division progress report (January 1991 to June 1992).** Ahmad, S.A.; Kartha, V.B. (eds.). Bhabha Atomic Research Centre, Bombay (India). 1993. 135p. Order Number DE94604074. Source: OSTI; NTIS (US Sales Only); INIS.

The research and development activities of the Spectroscopy Division during the calendar year 1990-1992 are reported in the form of individual summaries. These are arranged under the headings: (1) analytical spectroscopy, (2) infrared and Raman spectroscopy, (3) atomic spectra, (4) molecular and electronic spectra, (5) laser spectroscopy (6) synchrotron, beam foil and plasma spectroscopy, (7) optics, (8) design, fabrication and workshop etc. The list of publications and papers presented at the various conferences, symposia etc. by the staff members of the Division during the report period is given at the end. (author). figs.

1150 (BNL–48923, pp. 121-124) **Trace species detection: Spectroscopy and molecular energy transfer at high temperature.** Gray, J.A. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Monitoring the concentration of trace species such as atomic and molecular free radicals is essential in forming predictive models of combustion processes. LIF-based techniques have the necessary sensitivity for concentration and temperature measurements but have limited accuracy due to collisional quenching in combustion applications. The goal of this program is to use spectroscopic and kinetic measurements to quantify nonradiative and collisional effects on LIF signals and to develop new background-free alternatives to LIF. The authors have measured the natural linewidth of several OH A-X (3,0) rotational transitions to determine predissociation lifetimes in the upper state, which were presumed to be short compared to quenching lifetimes, and as a result, quantitative predictions about the applicability of predissociation fluorescence methods at high pressures are made. The authors are investigating collisional energy transfer in the A-state of NO. Quenching rates which enable direct corrections to NO LIF quantum yields at high temperature were calculations. These quenching rates are now being used in studies of turbulence/chemistry interactions. The authors have measured the electric dipole moment μ of excited-state NO using Stark quantum-beat spectroscopy. μ is an essential input to a harpoon model which predicts quenching efficiencies for NO (A) by a variety of combustion-related species. The authors are developing new coherent multiphoton techniques for measurements of atomic hydrogen concentration in laboratory flames to avoid the quenching problems associated with previous multiphoton LIF schemes.

1151 (BNL–48923, pp. 192-194) **Laser sources and techniques for spectroscopy and dynamics.** Kung, A.H. (Lawrence Berkeley Laboratory, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This program focuses on the development of novel laser and spectroscopic techniques in the IR, UV, and VUV regions for studying combustion related molecular dynamics at the microscopic level. Laser spectroscopic techniques have proven to be extremely powerful in the investigation of molecular processes which require very high sensitivity and selectivity. The authors approach is to use quantum electronic and non-linear optical techniques to extend the spectral coverage and to enhance the optical power of ultrahigh resolution laser sources so as to obtain and analyze photoionization, fluorescence, and photoelectron spectra of jet-cooled free radicals and of reaction products resulting from unimolecular and bimolecular dissociations. New spectroscopic techniques are developed with these sources for the detection of optically thin and often short-lived species. Recent activities center on regenerative amplification of high resolution solid-state lasers, development of tunable high power mid-IR lasers and short-pulse UV/VUV tunable lasers,

and development of a multipurpose high-order suppressor crossed molecular beam apparatus for use with synchrotron radiation sources. This program also provides scientific and technical support within the Chemical Sciences Division to the development of LBL's Combustion Dynamics Initiative.

1152 (BNL–48923, pp. 213-216) **Theoretical studies of molecular interactions.** Lester, W.A. Jr. (Univ. of California, Berkeley (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This research program is directed at extending fundamental knowledge of atoms and molecules including their electronic structure, mutual interaction, collision dynamics, and interaction with radiation. The approach combines the use of ab initio methods–Hartree-Fock (HF) multiconfiguration HF, configuration interaction, and the recently developed quantum Monte Carlo (MC)–to describe electronic structure, intermolecular interactions, and other properties, with various methods of characterizing inelastic and reaction collision processes, and photodissociation dynamics. Present activity is focused on the development and application of the QMC method, surface catalyzed reactions, and reorientation cross sections.

1153 (BNL–48923, pp. 268-271) **High-resolution inverse Raman and resonant-wave-mixing spectroscopy.** Rahn, L.A. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

These research activities consist of high-resolution inverse Raman spectroscopy (IRS) and resonant wave-mixing spectroscopy to support the development of nonlinear-optical techniques for temperature and concentration measurements in combustion research. Objectives of this work include development of spectral models of important molecular species needed to perform coherent anti-Stokes Raman spectroscopy (CARS) measurements and the investigation of new nonlinear-optical processes as potential diagnostic techniques. Some of the techniques being investigated include frequency-degenerate and nearly frequency-degenerate resonant four-wave-mixing (DFWM and NDFWM), and resonant multi-wave mixing (RMWM).

1154 (CNIC–00664) **Determination of 15 trace rare earth elements in high purity scandium oxide by horizontal ICP/AES after separation with chromatography.** Guan Jingsu (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Gao Binghua. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 11p. (In Chinese). (IAE–0112.). Order Number DE94604075. Source: OSTI; NTIS (US Sales Only); INIS.

An analytical method to determine 15 rare earth elements in high purity scandium oxide has been developed. In the method, the rare earth elements were separated from scandium and other impurity elements of non-rare earth by chromatographic and cation exchange procedure in which the CL-TBP levextrel resin is used as fixed phase and the 9 mol·L^{-1} HCl is used as eluent. After separation, the rare earth elements were determined by horizontal ICP/AES. For the 0.3 g sampling, it can analyze the Sc_2O_3 with purity of 99.99996% and total rare earth impurities of 0.31 $\mu g \cdot g^{-1}$(Ce, Pr and Nd are 0.05; Eu, Dy and Yb are 0.0033; the others are 0.017 $\mu g \cdot g^{-1}$). The recovery is from 85% to 110% and the relative standard deviation is less than 9%. The analytical results of 15 rare earth elements for two Sc_2O_3 samples determined by this method are in good agreement with other analytical methods.

1155 (DOE/ER/13613–45) **Capillary electrokinetic separations with optical detection: Technical progress report, February 1, 1993–January 31, 1994.** Sepaniak, M.J. Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry. [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-86ER13613. Order Number DE94001639. Source: OSTI; NTIS; GPO Dep.

This program seeks the development of capillary electrokinetic separation techniques and associated optical methods of detection. Fundamental studies of pertinent separation and band broadening mechanisms are being conducted, with the emphasis on understanding systems that include highly-ordered assemblies as running buffer additives. The additives include cyclodextrins, affinity reagents, and soluble (entangled) polymers and are employed with capillary electrophoresis, CE and/or micellar electrokinetic capillary chromatography, MECC modes of separation. The utility of molecular modeling techniques for predicting the effects of highly ordered assemblies on the retention behavior of isomeric compounds is under investigation. The feasibility of performing separations using a non-aqueous solvent/fullerene electrochromatographic system is being explored. The analytical methodologies associated with these capillary separation techniques are being advanced through the development of retention programming instumentation/techniques and new strategies for performing optical detection. The advantages of laser fluorimetry are extended through the inclusion of fluorogenic, reagents in the running buffer. These reagents include oligonucleotide intercalation reagents for detecting DNA fragments. Chemiluminescence detection using post-capillary reactors/flow cells is also in progress. Successful development of these separation and detection systems will fill current voids in the capabilities of capillary separation techniques.

1156 (DOE/ER/14224–T1) **Atomic probes of surface structure and dynamics: Technical progress report, September 15, 1991–September 14, 1992.** Heller, E.J.; Jonsson, H. Washington Univ., Seattle, WA (United States). Dept. of Chemistry. [1992]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-91ER14224. Order Number DE94001651. Source: OSTI; NTIS; INIS; GPO Dep.

The following were studied: New semiclassical method for scattering calculations, He atom scattering from defective Pt surfaces, He atom scattering from Xe overlayers, thermal dissociation of H_2 on Cu(110), spin flip scattering of atoms from surfaces, and Car-Parrinello simulations of surface processes.

1157 (DOE/ER/45076–3) **[Inelastic electron scattering from surfaces]: [Annual] progress report.** Wisconsin Univ., Milwaukee, WI (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER45076. Order Number DE94001738. Source: OSTI; NTIS; INIS; GPO Dep.

This program is aimed at the quantitative study of surface dynamical processes (vibrational, magnetic excitations) in crystalline slabs, ultrathin-layered materials, and chemisorbed systems on substrates, and of the geometric structure connected to these dynamical excitations. High-resolution electron-energy loss spectroscopy (HREELS) is a powerful probe. Off-specular excitation cross sections are much larger if electron energies are in the LEED range (50-300 eV). The analyses has been used to study surfaces of ordered alloys (NiAl). Ab-initio surface lattice dynamical results were combined with phonon-loss cross sections to achieve a more accurate microscopic description. First-principles phonon eigenvectors and eigenfrequencies were used as inputs to electron-energy-loss multiple scattering cross-section calculations. The combined microscopic approach was used to analyze EELS data of Cu(0001) and Ag(001) at two points. Positron diffraction is discussed as a structural and imaging tool. The relation between geometric structure of a film and its local magnetic properties will be studied in the future, along with other things.

1158 (DOE/ER/45076–T2) **[Inelastic electron scattering from surfaces]: [Progress report].** Wisconsin Univ., Milwaukee, WI (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER45076. Order Number DE94001368. Source: OSTI; NTIS; INIS; GPO Dep.

This program uses ab-initio and multiple scattering to study surface dynamical processes; high-resolution electron-energy loss spectroscopy is used in particular. Off-specular excitation cross sections are much larger if electron energies are in the LEED range (50–300 eV). The analyses have been extended to surfaces of ordered alloys. Phonon eigenvectors and eigenfrequencies were used as inputs to electron-energy-loss multiple scattering cross section calculations. Work on low-energy electron and positron holography is mentioned.

1159 (DOE/MC/26040–93/C0220) **Development of an electrochemical hydrogen separator.** Abens, S.; Fruchtman, J.; Kush, A. Energy Research Corp., Danbury, CT (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26040. (CONF-9306148–24: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019877. Source: OSTI; NTIS; GPO Dep.

The EHS is an electrochemical hydrogen separator based on the uniquely reversible nature of hydrogen oxidation-reduction reactions in electrochemical systems. The principle and the hardware concept are shown in Figure 1. Hydrogen from the mixed gas stream is oxidized to H^+ ions, transported through a cation transport electrolyte membrane (matrix) under an applied electric field and discharged in a pure hydrogen state on the cathode. The cation transfer electrolyte membrane provides a barrier between the feed and product gases. The EHS design is an offshoot of phosphoric acid fuel cell development. Although any proton transfer electrolyte can be used, the phosphoric acid based system offers a unique advantage because its operating temperature of ~200°C makes it tolerant to trace CO and also closely matches the water-shift reactor exit gas temperature (~250°C). Hydrogen-containing streams in coal gasification systems have large carbon monoxide contents. For efficient hydrogen recovery, most of the CO must be converted to hydrogen by the low temperature water-shift reaction (Figure 2). Advanced coal gasification and gas separation technologies offer an important pathway to the clean utilization of coal resources.

1160 (DOE/MC/26366–3456) **A calcium oxide sorbent process for bulk separation of carbon dioxide: Quarterly progress report, April 1993–June 1993.** Harrison, D.P. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering. Jul 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26366. Order Number DE94001728. Source: OSTI; NTIS; GPO Dep.

This research project is investigating the technical feasibility of a high-temperature, high pressure (HTHP) process for the bulk separation Of CO_2 from coal-derived gas. Phase I research, in which an electrobalance reactor was used to establish the technical feasibility of the regenerable sorbent process, was completed in March 1992 and results have been fully described in earlier quarterly reports. In Phase 1, the calcination and carbonation characteristics of three calcium sorbents were studied as a function of calcination and carbonation temperature and pressure, mol fraction CO_2 in the carbonation gas, and carbonation background gas composition. Desirable reaction conditions required for high reactivity and good sorbent durability were determined. Multicycle tests consisting of as many as ten complete calcination and carbonation cycles were completed. Indirect evidence which suggested that the water-gas shift reaction occurred simultaneously with CO_2 removal was found. Occurrence of the simultaneous reactions created the possibility of a direct one-step process for the manufacture of hydrogen from coal-gas while at the same time separating a concentrated stream of CO_2The concentrated CO_2 Stream could be quite significant if, in the future, environmental regulations restrict atmospheric CO_2 emissions.

1161 (DOE/MC/29220–93/C0221) **Evaluation of options for CO_2 capture/utilization/disposal.** Schmalzer, D.K.; Doctor, R.D.; Livengood, C.D. Argonne National Lab., IL (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29220 ;W-31109-ENG-38. (CONF-9306148–27: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019858. Source: OSTI; NTIS; GPO Dep.

The project objective is to develop engineering evaluations of technologies for the capture, use, and disposal of carbon dioxide (CO_2). This project emphasizes CO_2-capture technologies combined with integrated gasification combined-cycle (IGCC) power systems. Complementary evaluations win address CO_2 transportation, CO_2 use, and options for the long-term sequestration of unused CO_2. Commercially available CO_2-capture technology will provide performance and economic baselines for comparing innovative technologies. The intent of this research is to provide the CO_2 budget, or an "equivalent CO_2" budget asscciated with each of the individual energy-cycle steps, in addition to process design capital and operating costs. The value used for the "equivalent CO_2" budget is 1 kg CO_2/kWh$_e$. The base case is a 458-MW IGCC system using an air-blown Kellogg Rust Westinghouse (KRW) agglomerating fluidized bed gasifier, Illinois No. 6 bituminous coal feed, and in-bed sulfur removal. Three commercial CO_2 recovery technologies are under study: Amine scrubbing, Selexol, and Rectisol. Three emerging CO_2 recovery technologies are also being evaluated: High-temperature CO_2 separation with calcium- or magnesium-based sorbents, high-temperature molten-carbonate membranes for acid-gas removal, and ambient-temperature facilitated-transport membranes for acid-gas separation.

1162 (DOE/MC/29245–93/C0205) **High temperature size selective membranes.** Yates, S.F.; Swamikannu, A.X. Allied-Signal, Inc., Des Plaines, IL (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29245. (CONF-9306148–19: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019865. Source: OSTI; NTIS; GPO Dep.

The high temperature membrane, capable of operation above 550°C, is designed to be a composite membrane composed of a thin layer of a size selective membrane supported by a microporous ceramic support. The kinetic diameters of H_2 and CO_2 are 2.96 Å and 4.00 Å. The thin layer will be made from CMS whose pore size will be controlled to be less than 4 Å. The membrane will be truly size selective and be impermeable to carbon dioxide. The membrane will have higher selectivity than membranes which operate on Knudsen diffusion mechanism. The ceramic support will be fabricated from Allied Signal's proprietary Blackglas™ resin. The ceramic material, noted for its high thermal and oxidative resistance, has a coefficient of thermal expansion which matches closely that of CMS. The close match will insure mechanical integrity when the membrane is subjected to thermal cycles. The CMS layer will be produced by controlled pyrolysis of polymeric precursors. Pore size will be suitably modified by post-treatments to the carbon. The composite membrane will be tested for its permeation properties at 550°C or higher. Thermal, mechanical and chemical stability of the membrane will be assessed. We have produced several samples of CMS from polymeric precursors. We have initiated work also on the preparation of microporous supports from Blackglas™ resin. We have completed the design of the high temperature membrane pilot plant. The membrane cell was fabricated out of two kinds of stainless steel. The inner parts are made of SS 316 and the outer ring made of SS 420. The greater thermal expansion of the SS 316 will help obtain a leak free seal at the operating temperatures.

1163 (DOE/MC/30126–93/C0200) **Novel concept for an on-line alkali monitoring probe.** Sethi, V.K.; Smith, V. Western Research Inst., Laramie, WY (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30126. (CONF-9306148–9: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019355. Source: OSTI; NTIS; GPO Dep.

The underlying principle for the proposed probe is the determination of the dew point of the vapor phase compounds. Once the dew point has been established the concentration can be deduced from the available thermodynamic equilibrium data. The dew point of the vapor phase compounds can be established by force-condensing them on to sensors held at various temperatures. If the sensors can detect and discriminate the presence of liquid and solid phases, then the dew point can be readily measured. Several different approaches are possible for remotely detecting the presence of a liquid film on a sensing element. However, since high pressure and high temperature corrosive gases are involved, a rugged arrangement is required. Two different detection methodologies proposed for testing and evaluation are described below. Both have their own advantages and disadvantages.

1164 (DOE/METC/C–93/7102) **Improved plasma torch and data analysis software for an on-line, multielement ICP spectrometer designed for application to high temperature and pressure fossil fuel process streams.** Yip, J.; Pearce, K.D.;

Christy, C.E.; Barill, B.A.; Monteleone, S.M.; Chisholm, W.P. US-DOE Morgantown Energy Technology Center, WV (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). (CONF-930802–14: 206. American Chemical Society (ACS) national meeting, Chicago, IL (United States), 22-27 Aug 1993). Order Number DE93040379. Source: OSTI; NTIS; GPO Dep.

Rising concerns about the potential release of harmful elements into the environment from coal utilization have driven the development of new analytical capabilities. Especially useful to the suite of advanced technologies under development by the Morgantown Energy Technology Canter, (METC), would be a process monitor to perform real-time, multi-clement trace analysis in a high temperature and high pressure environment. The inductively coupled plasma (ICP) spectrometer has the potential to perform this kind of process monitoring. The role of the inductively coupled plasma, (ICP) as a process stream monitor for trace elements is only beginning to be realized, although it has been widely used for a number of years as a spectrometric emission source in elemental analysis laboratories. The shortcomings of conventional ICP systems plumbed directly to high temperature and pressure process systems have been previously discussed. Our previously reported torch design solved these problems, but suffered from a tendency for the plasma to erode some of the O-rings after several hours of operation. The new torch will be made of a insulating ceramic capable of direct connection to a hot sample line, but which also minimizes the tendency of the discharge to follow plasma gas leaks towards around. Also, the design protects some of the O-rings by providing water cooling between the O-rings and the hotter parts of the torch.

1165 (DOE/OR/00033–T538) **Detection of decontamination solution chelating agents using ion selective coated-wire electrodes.** Banks, M.L. (Arizona Univ., Tucson, AZ (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Arizona Univ., Tucson, AZ (United States). 1992. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000832. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to University of Arizona, Tucson, AZ.

This thesis explores feasibility of using coated-wire electrodes to measure chelating agent concentration. Chelating agents are often found in radioactive decontamination solutions because they aid in the removal of radionuclides from contaminated surfaces by increasing their solubility. However, this characteristic will also enhance the mobility of the radionuclide and thus its transport out of a waste disposal site. Coated-wire ion selective electrodes, based on a polyvinylchloride membrane using dioctylphthalate as a plasticizer and dinonylnaphthalenesulfonic acid as a counterion, were constructed for five commonly utilized chelating agents (ethylenediaminetetracetic acid (EDTA), nitrilotriacetic acid (NTA), citric acid, oxalic acid and tartaric add). The EDTA and NTA electrodes' calibration characteristics exhibited acceptable behavior in pure standard solutions. From data obtained while using the EDTA and NTA electrodes in a cement environment, further research needs to be done in the area of ion interference.

1166 (INIS-BR–3153) **Thermal decomposition of lanthanides (III) and yttrium (III) solid complexes from ethyl ene diamine tetraacetic acid.** Mercadante, A. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1991. 90p. (In Portuguese). Order Number DE94604076. Source: OSTI; NTIS (US Sales Only); INIS.

Solid state compounds of lanthanides (III) and yttrium derived from ethyl ene diamine tetraacetic acid were prepared from respective basic carbonates, that were neutralized with EDTA stoichiometry quantities. Complexometry with EDTA, thermogravimetry (TG), differential thermal analysis (DTA) and X-ray diffraction have been used in the study of these compounds. The results of complexometry with EDTA as well as TG and DTA curves bed to the stoichiometry of these compounds the following general formula is obeyed: H[Ln(EDTA)]. n H_2 O. X-ray powder patterns of these compounds permitted to establish two isomorphous series. The DTA ant TG curves allowed us to study the dehydration process, the thermal stability and thermal decomposition of these compounds. (C.G.C.).

1167 (INIS-BR–3165) **The Dom Feliciano belt in Santa Catarina State, Brazil.** Basei, M.A.S. Sao Paulo Univ., SP (Brazil). Inst. de Geociencias. 1985. 216p. (In Portuguese). Order Number DE94604020. Source: OSTI; NTIS (US Sales Only); INIS.

A geological synthesis and a proposal for the geotectonic evolution of the precambrian to eopaleozoic terrains of the southern part of Santa Catarina state is presented. The methods utilized were conventional (field works, petrological studies and bibliographic analysis), including structural analysis, lithogeochemical and geochronological investigations. Over a hundred new radiometric determinations, using several methods some of which not yet available in Brazil, as U-Pb in zircon and Pb-Pb and Sm-Nd in whole rocks, are presented. The results allowed us to determine the emplacement epoch of granitoids and consequently the associated deformational phases. (author).

1168 (INIS-BR–3166) **The geotectonic evolution of southern part of Sao Francisco Craton, based in geochronologic interpretation.** Teixeira, W. Sao Paulo Univ., SP (Brazil). Inst. de Geociencias. 1985. 229p. (In Portuguese). Order Number DE94604021. Source: OSTI; NTIS (US Sales Only); INIS.

Interpretation of available radiometric data from poly metamorphic terranes of southern part of the Sao Francisco Craton demonstrates the importance of geochronology as a tool in the study of ancient crustal evolution. In addition, radiometric study of basic intrusive magmatism helps define the most important epochs of crustal rifting during the Proterozoic. The definition of the southern border of the cratonic area based on distinctive age patterns of the geochronological provinces is also discussed. Finally, the geochronologic evolution of the Bambui platform cover is presented. Approximately 250 radiometric age determinations (Rb-Sr, K-Ar and Pb-Pb methods) were interpreted principally through the use of iso chronic diagrams. The geologic history tectonomagnetic events identified in this study is compared to the crustal evolution of similar segments of the Sao Francisco Craton and elsewhere. (author).

1169 (INIS-BR–3167) **Obtainment and characterization of pure and doped gadolinium oxy ortho silicates with terbium III, precursor of luminescent silicates with sulphur.** Simoneti, J.A. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1992. 191p. (In Portuguese). Order Number DE94604077. Source: OSTI; NTIS (US Sales Only); INIS.

Silicate and sulfide lattices are uniquely efficient luminescent materials to excitation by cathodic rays and furthermore the cathodoluminescence study of these compounds have been few investigated. In this work it has been prepared, characterized and investigated some spectroscopic properties of pure and Tb^{a+} - activated Gd_2 Si O_3 system and it has been tried to substitute oxygen by sulphur in order to obtain this or sulfide-silicate lattices. Products were characterized by vibrational infrared spectroscopy, powder X-ray diffraction patterns and electronic emission in UV-VIS region. (author).

1170 (INIS-BR–3168) **Preparation, characterization and thermal behaviour study of double selenates of lanthanides, yttrium and beryllium.** Ribeiro, C.A. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1988. 52p. (In Portuguese). Order Number DE94604078. Source: OSTI; NTIS (US Sales Only); INIS.

The lanthanides (III) and yttrium (III) double selenates were studied using common analytical methods, atomic absorption, X-ray diffraction infra-red absorption, thermogravimetry and differential thermal analysis. These compounds were prepared from the mixture of lanthanides (III) and yttrium (III) selenates aqueous solution and basic beryllium selenates aqueous solution, obeying equimolar relation (1:1) to the cation.

1171 (INIS-BR–3169) **Preparation, characterization and thermal behaviour study of lanthanides (III) and yttrium (III) 4-methoxy benzylidene pyruvate in solid state.** Oliveira, L.C.S. de. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1992. 64p. (In Portuguese). Order Number DE94604079. Source: OSTI; NTIS (US Sales Only); INIS.

Solid state compounds involving Ln and 4-Me O-B P, where Ln= trivalent lanthanides (except promethium) and yttrium and 4-Me O-B P=4-Methoxy benzylidene pyruvate, were prepared by addition of

ligand to the corresponding metal ions chlorides, both in aqueous solution. The precipitates were washed with distilled water and dried at ambient temperature in a forced circulation oven. Complexometry with EDTA, thermogravimetry (TG), differential scanning calorimetry (DSC) and X-ray diffraction have been used in the study of these compounds.

1172 (INIS-BR–3170) **Thermal decomposition of double selenates of lanthanides (III), yttrium (III) and ammonium.** Crespi, M.S. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1989. 90p. (In Portuguese). Order Number DE94604080. Source: OSTI; NTIS (US Sales Only); INIS.

Double selenates of lanthanides, yttrium and ammonium were prepared by treating mixtures of simple selenates with equimolar amounts and then dried in a vacuum desiccator containing anhydrous calcium chloride, protected from light. The compounds were studied using the conventional analytical methods such as infrared absorption spectra, X-ray diffraction, differential thermal analysis (DTA), and thermogravimetry (TG). (author).

1173 (INIS-BR–3171) **Thermal decomposition of lanthanides (III) and yttrium (III) selenates.** Ionashiro, M. UNESP, Araraquara, SP (Brazil). Inst. de Quimica. 1988. 63p. (In Portuguese). Order Number DE94604081. Source: OSTI; NTIS (US Sales Only); INIS.

Lanthanides (III) and yttrium (III) selenites were prepared by the addition of the sodium selenites to the solutions of the corresponding lanthanides III and yttrium III chlorides. The resulting precipitates were washed with water and dried at 60^{o} C in a forced circulation oven. The compounds were studied using conventional analytical methods, thermogravimetry (TG), differential thermal analysis (DTA) and X-ray diffractometry. (author).

1174 (INIS-BR–3174, pp. 115-125) **Neutron activation analysis in geological samples containing rare earths, uranium and thorium.** Vasconcellos, M.B.A.; Figueiredo, A.M.G.; Berretta, J.R.; Soares, J.C.A.C.R.; Fratin, L.; Goncales, O.L.; Botelho, S. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

The neutron activation analysis method was used for determination of rare earths, uranium, thorium and other tracks in geological samples, under the geological standard JB-1 (Geological Survey of Japan) and S-8 and S-13 (IAEA). (L.C.J.A.).

1175 (INIS-BR–3177) **Use of Sr and Nd isotopes in fluorite mineralization from 5. well, Segunda Linha Torrens, Santa Catarina Southeast, Brazil.** Tassinari, C.C.G. (Sao Paulo Univ., SP (Brazil). Inst. de Geociencias); Flores, J.A.A. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604023. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FLUORITE/isotope ratio; FLUORITE/mineralization; BRAZIL; DEPOSITS; FLUORITE; MINERALIZATION; GEOLOGIC SURVEYS; ISOTOPE DATING; METAMORPHISM; NEODYMIUM; RADIOMETRIC ANALYSIS; STRONTIUM

1176 (INIS-BR–3178) **Lithochemistry and geochronologic characterization of granitoids from Sobral Region - Santa Quiteria, Ceara Northwest, Brazil.** Lafon, J.M. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Gorayeb, P.S.S.; Tavares Junior, S.S. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604024. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/isotope dating; GRANITES/petrology; BRAZIL; GEOCHEMICAL SURVEYS; GRANITES; PETROLOGY; ISOTOPE RATIO; RUBIDIUM; STRONTIUM; TECTONICS

1177 (INIS-BR–3179) **Rb-Sr and K-Ar geochronology of mafic dyke swarms from Uaua, Bahia State, Brazil.** Leal, L.R.B. (Sao Paulo Univ., SP (Brazil). Inst. de Geociencias); Teixeira, W. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 1p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604025. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ROCKS/isotope dating; BRAZIL; GEOCHEMICAL SURVEYS; ISOTOPE RATIO; MAGMA; PETROLOGY; ROCKS; RUBIDIUM; STRONTIUM

1178 (INIS-BR–3180) **Rb/Sr ages of the Catalao II Alkaline Carbonatite Complex, Goias State, Brazil.** Lima Machado Junior, D. de (Universidade Estadual de Campinas, SP (Brazil). Inst. de Geociencias). Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604026. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CARBONATE ROCKS/isotope dating; CARBONATE ROCKS/isotope ratio; BRAZIL; GEOLOGIC FORMATIONS; GEOLOGY; RUBIDIUM; STRONTIUM

1179 (INIS-BR–3181) **Geologic and geomorphologic aspects of Paraguay Granite in the Region of Folha de Sao Felix do Xingu (SB.22-Y-B) - South of Para.** Macambira, E.M.B. (Companhia de Pesquisas de Recursos Minerais (CPRM), Belem, PA (Brazil)); Silva Jorge Joao, X. da; Lafon, J.M.; Pereira, E.D. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604027. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/geologic surveys; GRANITES/isotope dating; BRAZIL; GEOLOGY; GRANITES; ISOTOPE RATIO; MAPPING; MINERALS; RUBIDIUM; STRONTIUM

1180 (INIS-BR–3182) **The Brazilian thermo-tectonic poly phase synchronism from Patos-Seridó and Campina Grande (Borborema Province) shearing systems to the knowledge of ^{40} Ar/^{39} Ar dating of mono-crystal with laser probe.** Figueiredo, L.L. de (Nice Univ., 06 (France). Inst. de Geodynamique); Feraud, G.; Corsini, M.; Caby, R.; Arthaud, M.; Vaucher, A.; Archanjo, C.J.; Sa, E.F.J. de; Silva, M.E. da. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604028. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/isotope dating; MINERALS/shear; ARGON 39; ARGON 40; BRAZIL; ELECTRIC PROBES; MAGMA; METAMORPHISM; MINERALS; SHEAR; TECTONICS

1181 (INIS-BR–3184) **Potassium-argon age of ankaramite flow of Itaborai Basin, Rio de Janeiro, Brazil: tectonic implications.** Riccomini, C. (Sao Paulo Univ., SP (Brazil). Inst. de Geociencias); Francisco, B.H.R. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604029. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. OLIVINE/isotope dating; OLIVINE/rocks; ARGON; BASALT; BRAZIL; GEOLOGIC STRUCTURES; OLIVINE; ROCKS; POTASSIUM; SEDIMENTS; TECTONICS

1182 (INIS-BR–3187) **Carajas Mineral Province evolution based in new geochronological data.** Lafon, J.M. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Macambira, M. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94605094. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/isotope dating; ARGON 39; ARGON 40; BRAZIL; EVALUATION; GEOLOGIC FORMATIONS; GEOLOGIC STRUCTURES; LEAD; MINERALS; ROCKS; RUBIDIUM; STRONTIUM; URANIUM

1183 (INIS-BR–3188) **Viability of aragonite crystals use on dating by thermoluminescence.** Tatumi, S.H. (Sao Paulo Univ., SP (Brazil). Inst. de Fisica); Matsuoka, M.; Watanabe, S.; Nagatomo, T. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian

Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604030. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ARAGONITE/age estimation; ARAGONITE/thermoluminescence; ARAGONITE; THERMOLUMINESCENCE; COBALT 60; ELECTRON SPIN RESONANCE; RADIATION DOSES; SPECTRA; STABILITY

1184 (INIS-BR–3189) **Thermoluminescence properties study of a fish fossil and its dating.** Tatumi, S.H. (Sergipe Univ., Aracaju, SE (Brazil). Dept. de Fisica); Dantas, N.O.; Oliveira, M.I.T. de; Arenas, J.A.; Rocha, F.D.G.; Watanabe, S. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94605095. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FOSSILS/age estimation; FOSSILS/thermoluminescence; ACTIVATION ENERGY; COBALT 60; FISHES; FOSSILS; THERMOLUMINESCENCE; GAMMA RADIATION; RADIATION DOSES; SPECTRA

1185 (INIS-BR–3190) **Use of thermoluminescence (TL) and electron spin resonance (ESR) techniques on geologic dating.** Arenas, J.A.; Matsuoka, M.; Watanabe, S. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604031. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUARTZ/electron spin resonance; QUARTZ/thermoluminescence; SAND/electron spin resonance; SAND/thermoluminescence; AGE ESTIMATION; COBALT 60; GAMMA RADIATION; GEOLOGY; NATURAL RADIOACTIVITY; QUARTZ; THERMOLUMINESCENCE; RADIATION DOSES; SAND

1186 (INIS-BR–3191) **The greenstone belt of Goias (GO): geochronology.** Tomazzoli, E.R. (Santa Catarina Univ., Florianopolis, SC (Brazil). Dept. de Geociencias). Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 3p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604032. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GNEISSES/granites; GNEISSES/isotope dating; GRANITES/gneisses; GRANITES/isotope dating; ARGON; BRAZIL; GEOLOGIC FORMATIONS; GNEISSES; GRANITES; METAMORPHISM; POTASSIUM; RUBIDIUM; STRONTIUM

1187 (INIS-BR–3192) **Geochronologic and isotopic evidences of a transamazonic crustal accretion phenomenon, in Sao Francisco craton, Bahia State, Brazil.** Silva, M.G. da (Bahia Univ., Salvador, BA (Brazil). Inst. de Geociencias). Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604033. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/isotope dating; BRAZIL; GEOCHEMICAL SURVEYS; GEOCHEMISTRY; GEOLOGIC FORMATIONS; GEOLOGY; GRANITES; ISOTOPE RATIO; TECTONICS

1188 (INIS-BR–3193) **Pb-Pb and Rb-Sr geochronology in the Monte do Carmo - Porto Nacional region, Tocantins State, Brazil. New results.** Barradas, J.A. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Kotschoubey, B.; Lafon, J.M. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604034. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/isotope dating; BRAZIL; GEOLOGY; GRANITES; ISOTOPE RATIO; LEAD; MINERALS; RUBIDIUM; STRONTIUM

1189 (INIS-BR–3194) **Pb-Pb geochronology from Carajas Mineral Province: first results.** Rodrigues, E.S. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Lafon, J.M.; Scheller, T. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604035. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FELDSPARS/isotope dating; GRANITES/isotope dating; BRAZIL; COMPARATIVE EVALUATIONS; CONCENTRATION RATIO; FELDSPARS; GEOLOGY; GRANITES; ION EXCHANGE CHROMATOGRAPHY; LEAD; QUANTITATIVE CHEMICAL ANALYSIS; RESINS

1190 (INIS-BR–3195) **Rb-Sr geochronology of masticated and rhyolites dykes in the greenstone belt of Identidade, SE Para State, Brasil: partial results.** Souza, Z.S. de (Para Univ., Belem, PA (Brazil)); Lafon, J.M.; Sachett, C.R.; Dall'Agnol, R. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604036. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METAMORPHIC ROCKS/isotope dating; RHYOLITES/isotope dating; BRAZIL; ISOTOPE RATIO; PRECAMBRIAN ERA; RHYOLITES; RUBIDIUM; STRONTIUM

1191 (INIS-BR–3196) **Rearrange of Sm-Nd isotopic system during the neo proterozoic in Ribeirao gneisses, Goias State.** Pimentel, M.M. (Brasilia Univ., DF (Brazil). Inst. de Geociencias). Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604037. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GNEISSES/isotope ratio; BRAZIL; DIAGRAMS; GEOLOGIC AGES; GNEISSES; ISOTOPE DATING; NEODYMIUM; SAMARIUM; TECTONICS

1192 (INIS-BR–3197) **U-Pb age in meta volcanic zircon of greenstone from Supergrupo Andorinhas; delimitation of Archean stratigraphy from Carajas, Para State, Brazil.** Macambira, M. (Para Univ., Belem, PA (Brazil). Lab. de Geologia Isotopica); Lancelot, J. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 1p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604038. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ZIRCON/isotope dating; BRAZIL; GEOLOGIC FORMATIONS; GEOLOGIC SURVEYS; GNEISSES; LEAD; STRATIGRAPHY; URANIUM; ZIRCON

1193 (INIS-BR–3198) **Discordance of U-Pb and Rb-Sr radiometric ages in the Sao Francisco Meridional craton: evidence from the Complexo Metamorfico Bonfim Setentrional, Quadrilatero Ferrifero, Minas Gerais State, Brazil.** Carneiro, M.A. (Ouro Preto Univ., MG (Brazil). Dept de Geologia); Teixeira, W. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604039. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GNEISSES/isotope dating; GNEISSES/isotope ratio; BRAZIL; GEOCHEMISTRY; GEOLOGIC STRUCTURES; GNEISSES; METAMORPHISM; RUBIDIUM; SHEAR; STRONTIUM; STRONTIUM 86; STRONTIUM 87; TECTONICS; TITANITE; ZIRCON

1194 (INIS-BR–3199) **Dating by fission track method of some rocks from Cabo Frio and Buzios region.** Carmo Fonseca, A. do (Sao Paulo Univ., SP (Brazil). Inst. de Geociencias); Cordani, U.G.; Bigazzi, G. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604040. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/fission tracks; TITANITE/fission tracks; APATITES; ARGON; BRAZIL; COMPARATIVE EVALUATIONS; EXPERIMENTAL DATA; ISOTOPE DATING; POTASSIUM; TECTONICS; TITANITE

1195 (INIS-BR–3200) **Determination of zeta parameter for apatites dating by fission tracks.** Lelarge, M.L. (Centre National de la Recherche Scientifique (CNRS), Villeurbanne (France). Inst. Dolomieu); Poupeau, G. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 3p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec

1992). Order Number DE94604041. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/calibration standards; APATITES/fission tracks; AGE ESTIMATION; APATITES; EQUATIONS; GRANITES; ISOTOPE RATIO; URANIUM

1196 (INIS-mf–13730) **Study of the extraction of the traces of Cadmium through the method of subestequiometric isotope dilution.** Garate V, Z. (Pontificia Universidad Catolica del Peru, Lima (Peru)). Pontificia Univ. Catolica del Peru, Lima (Peru). Facultad de Ciencias e Ingenieria. 1990. 75p. (In Spanish). Order Number DE94604042. Source: OSTI; NTIS (US Sales Only); INIS.

In this work, it has been used the method of subestequiometric isotope dilution for the determination of traces of cadmium and it has been compared with other conventional's methods for study its performance. The conditions of the experiment had been studied carefully in order to optimize the parameters such as pH, (8,0 - 10,1) it used the buffer NH_3:NH_4Cl, the time of agitation (>120 s) and the concentration of the organic reactive (dithizone). Besides, it obtains the respective curve of calibration. In this study, we can watch a line relation in all the range studied (5-40 μg of Cd). This method applied to the analysis of Cadmium in a certified sample of H-8 of the IAEA, it gives us the next value: 195 $\pm$ 5,4 ppm (LOD= 1,5 ppm, LOQ= 4,8 ppm), it is enough satisfactory in comparison with the certified middle value of 188,9$\pm$19 ppm. It demonstrates the utility of the method in the Cadmium traces analysis if it disposes of the radioisotope of this element and the appropriate detection equipment. (DEM). 34 refs., 15 tabs., 7 figs.

1197 (INIS-mf–13731, pp. 79) **Application of FT dating to archaeometry: provenance studies of prehistoric obsidian artifacts.** Bigazzi, G. (CNR, Pisa (Italy)); Ercan, T.; Oddone, M.; Ozdogan, M.; Yegingil, Z. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/fission tracks; TEKTITES/archaeology; ARCHAEOLOGICAL SITES; TEKTITES; ARCHAEOLOGY; TURKEY

1198 (INIS-mf–13731, pp. 80-81) **Fission track dating of Hong Kong granites by comparison method with standard sample.** Liu Shunsheng (Changsha Inst. of Geotectonics, Academia Sinica (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/fission tracks; GRANITES/age estimation; CALIBRATION STANDARDS; COMPARATIVE EVALUATIONS; GRANITES; HONG KONG; NEUTRON FLUENCE

1199 (INIS-mf–13731, pp. 82) **Comparison of thermal stability between internal and external surfaces of zircon.** Koshimizu, S. (Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/temperature dependence; ZIRCON/age estimation; ZIRCON/fission tracks; COMPARATIVE EVALUATIONS; STABILITY; SURFACES; ZIRCON

1200 (INIS-mf–13731, pp. 85) **Some problems in fission track dating.** Long Tiancai (Tianjin Inst. of Geology and Mineral Resources (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/age estimation; DATA COVARIANCES; ETCHING; ZIRCON

1201 (INIS-mf–13731, pp. 86) **Fission track dating of quartz.** Hu Ruiying (Inst. of Geochemistry, Chinese Academy of Sciences, Guangzhou (China)); Chen Jingoing; Guo Shilun; Hao Xiuhong. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/age estimation; QUARTZ/age estimation; ETCHING; GOLD; QUARTZ; URANIUM

1202 (INIS-mf–13731, pp. 162) **On determination of the track age of some natural crystals.** Abdullaev, I.G. (Chudjant State Univ., Chudjant (Tajikistan)); Murtassaev, Ch.; Bankova, G.G.; Perelygin, V.P.; Petrova, R.I.; Enchjin, L.; Otgonsuren, O. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/crystals; FISSION TRACKS/spontaneous fission; AGE ESTIMATION; ANNEALING; APATITES; CRYSTALS; MICA; URANIUM 238

1203 (INIS-mf–13731, pp. 163) **Isothermal plateau fission track age determinations on volcanic glass shards.** Sandhu, A.S. (Dept. of Geology, Earth Sciences Centre, Univ. of Toronto, Toronto (Canada)); Westgate, J.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/age estimation; FISSION TRACKS/glass; GLASS; ISOTHERMAL PROCESSES; VOLCANOES

1204 (INIS-mf–13731, pp. 164) **Correction methods in fission track dating.** Singh, S. (Dept. of Physics, Guru Nanak Dev Univ. (India)); Singh, L.; Sandhu, A.S.; Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/corrections; FISSION TRACKS/age estimation; CORRECTIONS; ANISOTROPY; ANNEALING; MINERALS; ROCKS

1205 (INIS-mf–13731, pp. 167) **Determination of zeta constant for fission-track dating: A preliminary calibration by population method.** Ng, I.K. (Nuclear Energy Unit, Ministry of Science, Technology and Environment PUSPATI Complex, Bangi (Malaysia)); Gui, A.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/calibration; FISSION TRACKS/age estimation; CALIBRATION; APATITES; CALIBRATION STANDARDS; DOSEMETERS; GLASS

1206 (INIS-mf–13731, pp. 168) **Uranium content and age determination of various minerals of Iran.** Afarideh, H. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of)); Hashemi, F.; Habibi, M.F. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks*

in solids: abstracts. Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/age estimation; MINERALS/iran; URANIUM/concentration ratio; URANIUM/minerals; APATITES; FISSION TRACKS; MINERALS; IRAN; URANIUM

1207 (INIS-mf–13731, pp. 177) **Radon concentration measurements in a radon chamber for biological treatment using track detectors.** Tavera, L. (Inst. Nacional de Investigaciones Nucleares, (Mexico)); Camacho, M.E.; Balcazar, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/concentration ratio; RADON/exposure chambers; BIOLOGY; DIELECTRIC TRACK DETECTORS; DROSOPHILA; ESCHERICHIA COLI; RADON

1208 (INIS-mf–13731, pp. 183) **Measurement of concentrations of radon and its daughters in indoor atmosphere using CR-39 nuclear track detector.** Farid, S.M. (Dept. of Physics, Univ. of Swaziland, (Africa)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radon 222; RADON 222/concentration ratio; RADON 222/houses; AIR; ALPHA DETECTION; DAUGHTER PRODUCTS; DOSE EQUIVALENTS; HOUSES

1209 (INIS-mf–13731, pp. 309) **Calibration of zeta constant in fission track dating.** Zhai Pengji (Inst. of High Energy Physics, Academia Sinica, Beijing (China)); Zhao Yunlong. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/calibration; AGE ESTIMATION/fission tracks; CALIBRATION; APATITES; ETCHING; ZIRCON

1210 (INIS-mf–13731, pp. 310) **A study on standardization of fission track dating.** Wang Shicheng (Inst. of High Energy Physics, Acadimia Sinica (China)); Kang Tiesheng. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/standardization; FISSION TRACKS/age estimation; STANDARDIZATION; CALIBRATION; GLASS

1211 (INIS-mf–13731, pp. 328) **Analysis of human hair and lung samples from contaminated and non-contaminated regions of Byelorussia using the SSNTD technique.** Badr, I. (School of Physics and Space Research, Univ. of Birmingham, Birmingham (United Kingdom)); Durrani, S.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HAIR/activity levels; HAIR/dielectric track detectors; LUNGS/activity levels; LUNGS/dielectric track detectors; ALPHA PARTICLES; BELARUS; CHERNOBYLSK-4 REACTOR; CONTAMINATION; HAIR; LUNGS; MAN

1212 (INIS-mf–13731, pp. 329) **The uranium content of vegetables determined by method of fission track.** Chen Huailu (Lanzhou Univ., Lanzhou (China)); Jing Lanhua; Chen Fahu; Liu Xuezhen. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM/fission tracks; URANIUM/vegetables; CONCENTRATION RATIO; IRRADIATION; NEUTRONS; URANIUM; VEGETABLES

1213 (INIS-mf–13731, pp. 377) **Assessment of SSNTD technique for quantitative estimation of UO_2 content in natural UO_2-ThO_2 mixed oxide pellets in comparison to X-ray fluorescence, alpha and gamma spectrometry.** Shriwastwa, B.B. (Radio Metallurgy Division, Bhabha Atomic Research Centre, Trombay, Bombay (India)); Ghosh, J.K.; Bende, D.R.; Abani, M.C.; Raghunath, B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/quantitative chemical analysis; QUANTITATIVE CHEMICAL ANALYSIS/uranium oxides; ALPHA SPECTROSCOPY; BETA SPECTROSCOPY; COMPARATIVE EVALUATIONS; MIXTURES; THORIUM OXIDES; X-RAY FLUORESCENCE ANALYSIS

1214 (JINR-E–14-92-184) **Track radiography of heavy elements in minerals.** Abdullaev, I.G. (and others); Belogurov, O.G.; Vinokurov, S.F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1992. 7p. Order Number DE94605096. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of measurements of low concentration of heavy elements from Pt to Pb in minerals is considered. The comparison of sensitivity and spatial resolution of f.f. and alpha-radiography methods is made. 6 refs.; 2 figs.; 1 tab.

1215 (LA–12585) **The use of a new potentiostat/coulometer in the controlled-potential coulometric determination of plutonium.** Mendoza, P.G. Jr.; Temer, D.J.; Jackson, D.D. Los Alamos National Lab., NM (United States). Oct 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001162. Source: OSTI; NTIS; GPO Dep.

We evaluated a PAR 273 potentiostat and PAR 279 coulometer using iron as a stand-in for plutonium. Over 400 tuns consisting of electrical checks, blanks, and iron solutions were made. Manual operation of the instrumentation produced precisions better than 0.1%. Computer control of the instrumentation produced precisions better than 0.1%. Computer control of the instrumentation using a PC and a program written in QuickBASIC produced precisions of about 0.12%. The computer program automatically set up and controlled the instrumentation and recorded the data. The potentionstat's current autoranging function caused erractic coulometer results. Use of the PAR 273's low-pass filter (LPF) removed the amperometric end-point current noise, but it also biased the current. The PAR 273A's LPF filtered the noise without introducing a bias. The coulometer functions, such as current integration and communication interface, occasionally locked up after a current overrange condition. The occasional procedural error revealed that the potentionstat's ability to produce >1 A current can ruin the coulometer's impact circuitry, which is protected up to 0.2 A for current ranges <1 A.

1216 (LA–12597-MS) **A comparison of film and phosphor scanners.** Chancellor, T.; Morris, R.A. Los Alamos National Lab., NM (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001834. Source: OSTI; NTIS; GPO Dep.

Signal-to-noise ratios (SNRs) and spatial distortions have been measured for three types of scanners: the Molecular Dynamics (MD) and DuPont film scanners and the MD phosphor scanner. The MD film scanner is a deployable and compact scanner that gives a peak SNR of 110 for low (< 2.0) optical densities (ODs), but the spatial distortions across the digitized film plane are significant. The authors compare this with the DuPont film scanner,

which has equally good SNRs at low ODs, but very low spatial distortions. The DuPont also allows the user to define an OD range and contains a prescan function to find the suitable range if the user cannot input such a value; its scan times are quick, and the hardware allows for internal data averaging before being stored to disk. The MD phosphor imager has excellent low-dose capability, producing usable images at a 10-μrad dose (from a 150-pkeV source) but its SNRs are low compared to the film scanner, but they can be increased by adjusting the photomultiplier tube voltage and laser radius across the scan arc.

1217 (LA-UR–93-2660) **Studies of clays and clay minerals using x-ray powder diffraction and the Rietveld method.** Bish, D.L. Los Alamos National Lab., NM (United States). [1993]. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309232–1: Clay Minerals Society meeting on computer applications in clay mineralogy, San Diego, CA (United States), 25 Sep 1993). Order Number DE93040194. Source: OSTI; NTIS; INIS; GPO Dep.

The Rietveld method was originally developed (Rietveld, 1967, 1969) to refine crystal structures using neutron powder diffraction data. Since then, the method has been increasingly used with X-ray powder diffraction data, and today it is safe to say that this is the most common application of the method. The method has been applied to numerous natural and synthetic materials, most of which do not usually form crystals large enough for study with single-crystal techniques. It is the ability to study the structures of materials for which sufficiently large single crystals do not exist that makes the method so powerful and popular. It would thus appear that the method is ideal for studying clays and clay minerals. In many cases this is true, but the assumptions implicit in the method and the disordered nature of many clay minerals can limit titsapplicability. This chapter will describe the Rietveld method, emphasizing the assumptions important for the study of disordered materials, and it will outline the potential applications of the method to these minerals. These applications include, in addition to the refinement of crystal structures, quantitative analysis of multicomponent mixtures, analysis of peak broadening, partial structure solution, and refinement of unit-cell parameters.

1218 (LA-UR–93-3268) **Orientation Imaging Microscopy: New possibilities for microstructural investigations using automated BKD analysis.** Adams, B.L. (Brigham Young Univ., Provo, UT (United States). Dept. of Manufacturing Engineering and Engineering Technology); Kunze, K.; Dingley, D.J.; Wright, S.I. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309231–2: International conference on textures of materials, Clausthal (Germany), 20-24 Sep 1993). Order Number DE94000777. Source: OSTI; NTIS; GPO Dep.

A new microscopy, called Orientation Imaging Microscopy, is described. Imaging results from precise measurements of local lattice orientation rapidly obtained by Backscattered Kikuchi Diffraction. The hardware configuration of the microscope is described and a description of image formation presented. Applications to several materials of differing lattice structure are described. Connections of the microscopy with various aspects of modern texture analysis are emphasized.

1219 (ORNL/TM–12403) **Multicomponent liquid ion exchange with chabazite zeolites.** Robinson, S.M.; Arnold, W.D. Jr.; Byers, C.W. Oak Ridge National Lab., TN (United States). Oct 1993. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001780. Source: OSTI; NTIS; INIS; GPO Dep.

In spite of the increasing commercial use of zeolites for binary and multicomponent sorption, the understanding of the basic mass-transfer processes associated with multicomponent zeolite ion-exchange systems is quite limited. This study was undertaken to evaluate Na-Ca-Mg-Cs-Sr ion exchange from an aqueous solution using a chabazite zeolite. Mass-transfer coefficients and equilibrium equations were determined from experimental batch-reactor data for single and multicomponent systems. The Langmuir isotherm was used to represent the equilibrium relationship for binary systems, and a modified Dubinin-Polyani model was used for the multicomponent systems. The experimental data indicate that diffusion through the microporous zeolite crystals is the primary diffusional resistance. Macropore diffusion also significantly contributes to the mass-transfer resistance. Various mass-transfer models were compared to the experimental data to determine mass-transfer coefficients. Effective diffusivities were obtained which accurately predicted experimental data using a variety of models. Only the model which accounts for micropore and macropore diffusion occurring in series accurately predicted multicomponent data using single-component diffusivities. Liquid and surface diffusion both contribute to macropore diffusion. Surface and micropore diffusivities were determined to be concentration dependent.

1220 (SAND–93-1617C) **Generic microelectronic smart sensor platform for detection of toxic, hazardous, and flammable gases.** Rodriguez, J.; Corbett, W.; Montague, S.; Knoll, M.; McWhorter, P. Sandia National Labs., Albuquerque, NM (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931215–1: International electron devices meeting, Washington, DC (United States), 5-8 Dec 1993). Order Number DE93017626. Source: OSTI; NTIS; GPO Dep.

Extensive work has been performed in the past which demonstrates that various metal alloys can be used to detect different toxic, hazardous, and flammable gases. Work has been performed using Pd, Pt, Ir, PdNi, PdAg and Pt/Pd for detecting things such as Hydrogen, Hydrazine, Hydrogen Sulfide, Deuterium, Tritium, Ethanol and Hexane. Perhaps the most familiar is the use of Pd and PdNi for the detection of Hydrogen. These devices work by examining the effect of the gases on the material properties of the metal alloys. Two of the most common material properties examined in these sensors are the resistance of thin film resistors, and the flatband or threshold voltage shifts of MOS structures fabricated with a particular alloy as the gate material. While research into these sensing techniques has shown much promise, few manufacturable, fieldable devices have resulted. These sensing techniques are prone to drift problems due to temperature variations, and typically have large sample to sample variations in performance due to process control issues. Typically, these sensors require significant external instrumentation for measurement and control, making the systems large and expensive. Sandia National Laboratories has designed, fabricated and demonstrated complete functionality of a generic microelectronic based smart sensor platform intended to effectively exploit the research mentioned above into high performance, manufacturable, fieldable devices. This smart sensor platform technology fabricates 2 μm CMOS digital and analog control electronics, sensing elements, and temperature control elements on the same silicon integrated circuit. Our initial demonstration of this technology incorporates PdNi as the sensing alloy for the detection of hydrogen.

1221 (SAND–93-2265C) **Chemically sensitive interfaces on SAW devices.** Ricco, A.J. (Sandia National Labs., Albuquerque, NM (United States)); Martin, S.J.; Crooks, R.M.; Xu, Chuanjing; Allred, R.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-930802–16: 206. American Chemical Society (ACS) national meeting, Chicago, IL (United States), 22-27 Aug 1993). Order Number DE94001832. Source: OSTI; NTIS; GPO Dep.

Using surface acoustic wave (SAW) devices, three approaches to the effective use of chemically sensitive interfaces that are not highly chemically selective have been examined: (1) molecular identification from time-resolved permeation transients; (2) using multifrequency SAW devices to determine the frequency dependence of analyte/film interactions; (3) use of an array of SAW devices bearing diverse chemically sensitive interfaces to produce a distinct response pattern for each analyte. In addition to their well-known sensitivity to mass changes (0.0035 monolayer of N_2 can be measured), SAW devices respond to the mechanical and electronic properties of thin films, enhancing response information content but making a thorough understanding of the perturbation critical. Simultaneous measurement of changes in frequency and

attenuation, which can provide the information necessary to determine the type of perturbation, are used as part of the above discrimination schemes.

1222 (UCRL-JC–111288) **Dynamics of surface thermal expansion and diffusivity using two-color reflection transient gratings.** Pennington, D.M. (California Univ., Berkeley, CA (United States). Dept. of Chemistry); Harris, C.B. Lawrence Livermore National Lab., CA (United States). Feb 1993. 14p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48 ;AC03-76SF00098. (CONF-930159–57: OE/LASE '93: International Society for Optical Engineering (SPIE) conference, Los Angeles, CA (United States), 13-23 Jan 1993). Order Number DE93040547. Source: OSTI; NTIS; GPO Dep.

We report ultrafast measurements of the dynamic thermal expansion of a surface and the temperature dependent surface thermal diffusivity using a two-color reflection transient grating technique. Studies were performed on p-type, n-type, and undoped GaAs(100) samples at several temperatures. Using a 75 fs ultraviolet probe with visible excitation beams, the electronic effects that dominate single color experiments become negligible; thus surface expansion due to heating and the subsequent contraction caused by cooling provide the dominant influence on the diffracted probe. The diffracted signal was composed of two components, thermal expansion of the surface and heat flow away from the surface, allowing the determination of the rate of expansion as well as the surface thermal diffusivity. At room temperature a signal rise due to thermal expansion was observed, corresponding to a maximum average displacement of $\approx$ 1 Å at 32 ps. Large fringe spacings were used, thus the dominant contributions to the signal were expansion and diffusion perpendicular to the surface. Values for the surface thermal diffusivity of GaAs were measured and found to be in reasonable agreement with bulk values above 50°K. Below 50°K, the diffusivity at the surface was more than an order of magnitude slower than in the bulk due to increased phonon boundary scattering. Comparison of the results with a straightforward thermal model yields good agreement over a range of temperatures (12–300°K). The applicability and advantages of the transient grating technique for studying photothermal and photoacoustic phenomena are discussed.

1223 (UCRL-JC–114139) **Development of ^{129}I AMS for the LLNL spectrometer.** Proctor, I.D.; Southon, J.R.; Roberts, M.L. Lawrence Livermore National Lab., CA (United States). 17 Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930960–1: 6. international conference on accelerator mass spectrometry, Canberra (Australia), 17 Sep - 1 oct 1993). Order Number DE94002015. Source: OSTI; NTIS; GPO Dep.

The Multi-user Tandem Laboratory at LLNL was designed to be a versatile facility which could be configured to develop new capabilities as determined by the requirements of sponsoring agencies and experimental programs. The initial design made some compromises, driven by both the usual budgetary constraints and uncertainties in program needs and support. We were recently funded by the Office of Arms Control in the US DOE to develop an ^{129}I AMS capability. The first ^{129}I measurements were performed this year after upgrades and modifications to the initially installed components were completed. The configuration of the present spectrometer and performance achieved to date will be described. Planned improvements to the injector and high energy spectrometer will be outlined.

1224 (WAPD-T–2941) **Practical experience with on-line ion chromatography.** Lynch, G.J. Westinghouse Electric Corp., Pittsburgh, PA (United States). Bettis Atomic Power Div. [1991]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195 ;AC11-89PN38014. Contract N00024-89-C-4003. (CONF-910311–3: 42. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy, Chicago, IL (United States), 4-8 Mar 1991). Order Number DE94001762. Source: OSTI; NTIS; GPO Dep.

Bettis is heavily involved in on-line ion chromatography and has gained much experience with the systems. This paper serves to pass that experience along to any users, current or prospective, that are interested in the systems. On-line IC is extremely dynamic and the developments over the past few years have helped to produce systems that can provide technical and productivity improvements. The potential uses of the systems are only beginning to be tapped. It is the information provided herein maybe useful to any interested in on-line ion chromatography.

1225 (WINCO–1127) **Development of a continuous process for adjusting nitrate, zirconium, and free hydrofluoric acid concentrations in zirconium fuel dissolver product.** Cresap, D.A.; Halverson, D.S. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Apr 1993. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000722. Source: OSTI; NTIS; INIS; GPO Dep.

In the Fluorinel Dissolution Process (FDP) upgrade, excess hydrofluoric acid in the dissolver product must be complexed with aluminum nitrate (ANN) to eliminate corrosion concerns, adjusted with nitrate to facilitate extraction, and diluted with water to ensure solution stability. This is currently accomplished via batch processing in large vessels. However, to accommodate increases in projected throughput and reduce water production in a cost-effective manner, a semi-continuous system (In-line Complexing (ILC)) has been developed. The major conclusions drawn from tests demonstrating the feasibility of this concept are given in this report.

1226 (WSRC-RP–91-865) **Procedure for separation of Se and determination of Se-79 by liquid scintillation.** Dewberry, R.A. Westinghouse Savannah River Co., Aiken, SC (United States). 11 Aug 1991. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001808. Source: OSTI; NTIS; GPO Dep.

This report describes the development work and demonstration of a technique for separation of selenium suitable for determination of Se-79 by liquid scintillation counting. The technique has been demonstrated on actual DWPF (Defense Waste Processing Facility) sludge samples which contain very large loads of Sr-90 activity. The separation required a decontamination of selenium from Sr by a factor of over 10^6, from Co and Cs by factor of 10^4, and from Tc-99 by a factor of 100, while still maintaining a selenium recovery of about 50%. Using this technique the author has determined Se-79 in five actual DWPF samples with a precision of about 70% relative standard deviation. This separation has not been demonstrated on actual DWPF samples which have the largest Cs-137 loads. He does not anticipate that these untested samples will present a difficult problem.

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Refer also to citation(s) 33, 44, 833, 881, 968, 1144, 1155, 1284, 1287, 1353, 1442, 1865, 1885, 1989, 1991, 2240, 2845

1227 (AAA-KTF/FKF–91/17) **Modelling the chemistry in lime kilns.** Backman, R. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 41p. Order Number DE94709688. Source: OSTI; NTIS.

LIEKKI Research Programme.

Many chemical reactions, besides the main reaction, calcining of lime mud to calcium oxide, can effect on the operation of a lime kiln. Formation of lime pellets at the hot end is strongly effected by the presence of sodium and sulfur in the lime mud and the flue gases, so the formation of rings and balls can be severe in some kilns. The objectives of the present work are to study the reactions involving sodium and sulfur in a lime kiln, to derive practically useful material balance equations, and to explore how chemical equilibrium modelling can be used as a tool in lime kiln optimization and control. The work is divided into three parts: (1) examination of composition of material flows into the kiln and parameters that are important for kiln operations, (2) deriving a total mass balance model based on operational parameters, and (3) investigation of the chemistry inside the kiln. In part 3 of the work, the distribution of sodium and sulfur between mud/lime, dust and flue gases are calculated on the basis of chemical equilibrium. The use of some reactor models are demonstrated and tested.

1228 (AAA-KTF/FKF–93/1) **Experimental setup for studying the kinetics of high temperature gas reactions.** Chowdhury, K. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1993. 33p. Order Number DE94709694. Source: OSTI; NTIS.

LIEKKI Research Programme.

Experimental setup for kinetic studies of high temperature gas reactions has been installed and tested at Aabo Akademi. The heart of the system is a plug flow reactor made of quartz originally designed and constructed at the Technical University of Denmark. In this reactor reactant gases are preheated separately and rapidly mixed in the active part of the reactor. The reaction mixture is quenched after leaving the active part of the reactor by cooling air supplied by an air compressor. The reactor is placed in an electric furnace, the temperature profile of which was measured. The maximum operating temperature of the furnace is 1100 deg C. The temperature profile of the active part of the reactor inside the furnace was found to be uniform. Some test runs have been carried out within the residence time of roughly 0.06-0.07 sec. So far it is possible to analyse N_2, N_2O, NO, and NH_3. An IR gas analyzer was used to measure NO concentration. NH_3 was measured by scrubbing it into aqueous acidic solution. N_2 and N_2O were measured by gas chromatograph equipped with a thermal conductivity detector. Primary tests with 'the thermal DeNOx reaction' give reproducible results which are reported.

1229 (AAA-KTF/IVT–91/16) **Fuzzy multi-attribute determination of adsorbents capacities.** Kraslawski, A. (Lappeenranta Univ. of Technology, Lappeenranta (Finland)); Nystroem, L.; Bulsari, A.B.; Saxen, H. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1991. 11p. Order Number DE94709663. Source: OSTI; NTIS.

A method is presented for the determination of adsorbents capacities. It is based on the multi-attribute optimization. The fuzzy non-dominance relations are used as the tool of the variants evaluation. The evaluation of adsorbing capacity is based on the analysis of two parameters: effective surface diffusion coefficient and absorbability at infinite dilution. An example of the determination of adsorbent capacity is presented for the case of 12 adsorbates.

1230 (ANL/CHM/CP–80906) **Spectroscopic studies of magnetic transitions in $TbPO_4$.** Liu, G.K. (Argonne National Lab., IL (United States)); Loong, C.K.; Trouw, F.; Abraham, M.M.; Boatner, L.A. Argonne National Lab., IL (United States); Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ;AC05-84OR21400. (CONF-931133–2: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE94001274. Source: OSTI; NTIS; INIS; GPO Dep.

Rare-earth orthophosphates, RPO_4 (R = Tb to Lu), crystallize in the tetragonal zircon structure in which R occupies sites of D_{2d} symmetry. The R = Tb, Dy, Ho compounds order antiferromagnetically at low temperature with the rare-earth moments parallel to the crystallographic c-axis. In $TbPO_4$ the magnetic transition is accompanied by a cooperative Jahn-Teller effect involving Tb ion-lattice coupling which induces a tetragonal-to-monoclinic distortion of the crystal lattice and a readjustment of the Tb electronic states as required by the lowering of the rare-earth site symmetry. The laser excitation and emission spectra of $TbPO_4$ and 0.1% Tb doped YPO_4 single crystals were studied below and above the phase transition temperature. Line shapes of transitions in the stoichiometric compound are unusually broad and asymmetric whereas those for the dilute compound are sharp. The $TbPO_4$ spectra show an anomalous temperature dependence near the phase transitions, indicating strong interactions of rare-earth ions with environment. Comparison of the optical results with neutron scattering is made.

1231 (BARC–1992/E/045) **Studies on inorganic exchangers : hydrous manganese (II) oxide.** Mathew, C. (Bhabha Atomic Research Centre, Bombay (India). Isotope Div.); Rao, K.L.N.; Dash, A.; Varma, R.N.; Balasubramanian, K.R.; Murthy, T.S. Bhabha Atomic Research Centre, Bombay (India). 1992. 24p. Order Number DE94604121. Source: OSTI; NTIS (US Sales Only); INIS.

The inorganic exchanger hydrous manganese dioxide has been prepared and its characteristics evaluated. A method has been developed for the separation of ^{144}Ce from fission products solution using this exchanger. (author). 16 refs., 4 figs., 5 tabs.

1232 (BNL–48923, pp. 20-23) **Photoionization-photoelectron research.** Berkowitz, J. (Argonne National Laboratory, IL (United States)); Ruscic, B. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The photoionization research program is aimed at understanding the basic processes of interaction of vacuum ultraviolet (VUV) light with atoms and molecules. This research provides valuable information on both thermochemistry and dynamics. Recent studies include atoms, clusters, hydrides, sulfides and an important fluoride.

1233 (BNL–48923, pp. 47-48) **Laser spectroscopy of hydrocarbon radicals.** Chen, P. (Harvard Univ., Cambridge, MA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract FG02-90ER14132. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The author reports the application of supersonic jet flash pyrolysis to the specific preparation of a range of organic radicals, biradicals, and carbenes in a skimmed molecular beam. Each species was produced cleanly and specifically, with little or no secondary reactions by the thermal dissociation of appropriately designed and synthesized organic precursors. Photoelectron spectra of the three isomeric C_3H_2 carbenes, ortho-benzyne, and the α,3-dehydrotoluene biradical, were used to establish adiabatic ionization potentials for use in thermochemical determinations.

1234 (BNL–48923, pp. 49-51) **Laser spectroscopy and dynamics of transient species.** Clouthier, D.J. (Univ. of Kentucky, Lexington (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is to study the vibrational and electronic spectra and excited state dynamics of a number of transient sulfur and oxygen species. A variety of supersonic jet techniques, as well as high resolution FT-IR and intracavity dye laser spectroscopy, have been applied to these studies.

1235 (BNL–48923, pp. 70-73) **Intramolecular and nonlinear dynamics.** Davis, M.J. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Research in this program focuses on three interconnected areas. The first involves the study of intramolecular dynamics, particularly of highly excited systems. The second area involves the use of nonlinear dynamics as a tool for the study of molecular dynamics and complex kinetics. The third area is the study of the classical/quantum correspondence for highly excited systems, particularly systems exhibiting classical chaos.

1236 (BNL–48923, pp. 94-97) **Studies of ground-state dynamics in isolated species by ionization-detected stimulated Raman techniques.** Felker, P.M. (Univ. of California, Los Angeles (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

First, the author aims to develop methods of nonlinear Raman spectroscopy for application in studies of sparse samples. Second,

the author wishes to apply such methods to structural and dynamical studies of species (molecules, complexes, and clusters) in supersonic molecular beams. In the past year, the author has made progress in several areas. The first pertains to the application of mass-selective ionization-detected stimulated Raman spectroscopies (IDSRS) to the size-specific vibrational spectroscopy of solute-solvent$_n$ clusters. The second involves the application of IDSRS methods to studies of jet-cooled benzene clusters. The third pertains to the use of IDSRS methods in the study of intermolecular vibrational transitions in van der Waals complexes.

1237 (BNL–48923, pp. 153-156) **Spectroscopic investigation of the vibrational quasi-continuum arising from internal rotation of a methyl group.** Hougen, J.T. (NIST, Gaithersburg, MD (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference*. 391p. Order Number DE93015758. Source: OSTI; NTIS.

The goal of this project is to use spectroscopic techniques to investigate in detail phenomena involving the vibrational quasi-continuum in a simple physical system. Acetaldehyde was chosen for the study because: (i) methyl groups have been suggested to be important promotors of intramolecular vibrational relaxation, (ii) the internal rotation of a methyl group is an easily describle large-amplitude motion, which should retain its simple character even at high levels of excitation, and (iii) the aldehyde carbonyl group offers the possibility of both vibrational and electronic probing. The present investigation of the ground electronic state has three parts: (1) understanding the "isolated" internal-rotation motion below, at, and above the top of the torsional barrier, (2) understanding in detail traditional (bond stretching and bending) vibrational fundamental and overtone states, and (3) understanding interactions involving states with multiquantum excitations of at least one of these two kinds of motion.

1238 (BNL–48923, pp. 217-220) **Quantum dynamics of fast chemical reactions.** Light, J.C. (Univ. of Chicago, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference*. 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The aims of this research are to explore, develop, and apply theoretical methods for the evaluation of the dynamics of gas phase collision processes, primarily chemical reactions. The primary theoretical tools developed for this work have been quantum scattering theory, both in time dependent and time independent forms. Over the past several years, the authors have developed and applied methods for the direct quantum evaluation of thermal rate constants, applying these to the evaluation of the hydrogen isotopic exchange reactions, applied wave packet propagation techniques to the dissociation of Rydberg H_3, incorporated optical potentials into the evaluation of thermal rate constants, evaluated the use of optical potentials for state-to-state reaction probability evaluations, and, most recently, have developed quantum approaches for electronically non-adiabatic reactions which may be applied to simplify calculations of reactive, but electronically adiabatic systems. Evaluation of the thermal rate constants and the dissociation of H_3 were reported last year, and have now been published.

1239 (BNL–48923, pp. 245-247) **Theoretical aspects of gas-phase molecular dynamics.** Muckerman, J.T. (Brookhaven National Laboratory, Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference*. 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Research in this program is focused on the development and application of time-dependent quantum mechanical and semiclassical methods for treating inelastic and reactive molecular collisions, and the photochemistry and photophysics of atoms and molecules in laser fields. Particular emphasis is placed on the development and application of grid methods based on discrete variable representations, on time-propagation methods, and, in systems with more that a few degrees of freedom, on the combined use of quantal wavepackets and classical trajectories.

1240 (BNL–48923, pp. 272-275) **Reactions of carbon atoms in pulsed molecular beams.** Reisler, H. (Univ. of Southern California, Los Angeles (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference*. 391p. Order Number DE93015758. Source: OSTI; NTIS.

This research program consists of a broad scope of experiments designed to unravel the chemistry of atomic carbon in its two spin states, P and D, by using well-controlled initial conditions and state-resolved detection of products. Prerequisite to the proposed studies (and the reason why so little is known about carbon atom reactions), is the development of clean sources of carbon atoms. Therefore, in parallel with the studies of its chemistry and reaction dynamics, the authors continuously explore new, state-specific and efficient ways of producing atomic carbon. In the current program, C(^{3}P) is produced via laser ablation of graphite, and three areas of study are being pursued: (i) exothermic reactions with small inorganic molecules (e.g., O_2, N_2O, NO_2) that can proceed via multiple pathways; (ii) the influence of vibrational and translational energy on endothermic reactions involving H-containing reactants that yield CH products (e.g., H_2O H_2CO); (iii) reactions of C(^{3}P) with free radicals (e.g., HCO, CH_3O). In addition, the authors plan to develop a source of C(^{1}D) atoms by exploiting the pyrolysis of diazotetrazole and its salts in the ablation source. Another important goal involves collaboration with theoreticians in order to obtain relevant potential energy surfaces, rationalize the experimental results and predict the roles of translational and vibrational energies.

1241 (BNL–48923, pp. 276-278) **Spectroscopic probes of vibrationally excited molecules at chemically significant energies.** Rizzo, T.R. (Univ. of Rochester, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference*. 391p. Order Number DE93015758. Source: OSTI; NTIS.

This project involves the application of multiple-resonance spectroscopic techniques for investigating energy transfer and dissociation dynamics of highly vibrationally excited molecules. Two major goals of this work are: (1) to provide information on potential energy surfaces of combustion related molecules at chemically significant energies, and (2) to test theoretical modes of unimolecular dissociation rates critically via quantum-state resolved measurements.

1242 (CNIC–00632) **Screening of sorption materials for radioiodine and technetium.** Zeng Jishu (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Xia Deying. China Nuclear Information Centre, Beijing, BJ (China). May 1992. 7p. (In Chinese). (IAE–0105.). Order Number DE94604096. Source: OSTI; NTIS (US Sales Only); INIS.

By using batch sorption experiments to determine sorption ratios for I^- and TcO_4^- ions have been completed. Fifteen kinds of industrial products and minerals from China were tested. Tests were performed at 25 degree C constant temperature in traced pre-equilibrated water or deionized water. The test results show that the sorption ratios of I for tiemannite and active carbon of apricot-shell are of the order 10^3 mL/g, while the sorption ratio of TcO_4^- for jamesonite is of the order 10^4 mL/g. These materials can be considered as selected backfill materials to improve capability of depository for preventing iodine and technetium ions from migrating. Comparing results of sorption ratios of I^- and TcO_4^- both in pre-equilibrated water and deionized water, in most cases values are nearly the same. Although the difference of sorption ratio between two solutions for a few materials is as high as 5 times, it is still feasible for screening sorption materials by using traced deionized water system.

1243 (DOE/ER/13373–T3) **The combination reaction of CH_3 and C_6H_5O.** Lin, C.Y. (Catholic Univ. of America, Washington, DC (United States). Dept. of Chemistry); Lin, M.C. Catholic Univ. of America, Washington, DC (United States). Dept. of Chemistry.

[1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-85ER13373. Order Number DE94001582. Source: OSTI; NTIS; GPO Dep.

Kinetics and mechanism of the CH_3 + C_6H_5O reaction have been examined by means of the RRKM theory and kinetic modeling. Both the high temperature shock tube data for the production of cresols and the low temperature branching ratios (for production of cresols vs. methylcyclohexadienones, $CH_3C_6H_5O$) derived from Mulcahy and William's data on the pyrolysis of di-t-butyl peroxide and phenol mixtures (Ref. 1) could be reasonably accounted for by the mechanism: $CH_3 + C_6H_5O \rightarrow CH_3C_6H_5O^* \rightarrow$ o- and p-$CH_3C_6H_4OH + M \rightarrow CH_3C_6H_5O$. The energy barrier for the thermal isomerization of $CH_3C_6H_5O$ to cresols was estimated to be ~132 kJ mol^{-1}.

1244 (DOE/ER/13406–8) **Organometallic chemistry of bimetallic compounds: Annual progress report.** Casey, C.P. Wisconsin Univ., Madison, WI (United States). Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER13406. Order Number DE94002313. Source: OSTI; NTIS; GPO Dep.

Research is reported under 5 headings: reactions of heterobimetallic dihydrides (hydrogenation of alkynes by Re, Pt complex), metal-metal double bonds (Re=Re), $C_5Me_5Co{=}CoC_5Me_5$ is actually $(C_5Me_5)_3Co_3(\mu_2\text{-}H)_3(\mu_3\text{-}H)$, reactions of $(C_5Me_5)_3Co_3(\mu_2\text{-}H)_3(\mu_3\text{-}H)$, and wide bite angle phosphines in hydroformylation.

1245 (DOE/ER/13582–T3) **Study of improved methods for predicting chemical equilibria: Final report, January 1, 1990–March 31, 1993.** Lenz, T.G.; Vaughan, J.D. Colorado State Univ., Fort Collins, CO (United States). Sep 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13582. Order Number DE94001647. Source: OSTI; NTIS; GPO Dep.

Objective was to develop computational methods for equilibrium constants of Diels-Alder reactions in gas and liquid solution phases. Approach was to calculate standard enthalpies of formation at 298 K and standard thermodynamic functions for a range of temperatures for reactants and products, and then to calculate standard enthalpies, entropies, Gibbs free energies, and equilibrium constants at various temperatures.

1246 (DOE/ER/13777–T2) **Prediction of thermodynamic properties of coal derivatives: Final technical report, March 1, 1991–February 28, 1994.** Donohue, M.D. Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Chemical Engineering. Sep 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13777. Order Number DE94001867. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed new equations of state for pure-component chain molecules. The excellent performance of complicated theories, such as the Generalized Flory Dimer (GFD) theory can be mimicked by simpler equations, if assumptions for the shape parameters are made. We developed engineering correlations based on GFD theory, using local composition theory to take into account attractive forces. During this period, we compared methods for calculating repulsive and attractive contributions to equation of state against computer simulation data for hard and square-well chains, and against experimental data from the literature. We also have studied microstructure and local order in fluids that contain asymmetric molecules. We developed a thermodynamic model for polar compounds based on a site-site interaction approach. We have shown the equivalence of various classes of theories for hydrogen bonding, and used this equivalence to derive a multiple site model for water. In addition, simple cubic equations of state have been applied to calculate physical and chemical-reaction equilibria in nonideal systems. We measured infinite dilution activity coefficients using HPLC. We also measured high pressure vapor liquid equilibria of ternary and quaternary systems containing supercritical solvents. We used FT-IR spectroscopy to examine self-association of aliphatic alcohols due to hydrogen bonding, and to investigate the hydrogen bonding in polymer-solvent mixtures.

1247 (DOE/ER/13790–5) **Characterization of the metal-support interface in supported metal and supported metal complex catalysts: [Final report].** Gates, B.C. Delaware Univ., Newark, DE (United States). Center for Catalytic Science and Technology. [1992]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13790. Order Number DE94001798. Source: OSTI; NTIS; GPO Dep.

Re and Ir carbonyls, and other compounds, were chosen as precursors. MgO, La_2O_3, zeolite NaX and KL, among others, were chosen as supports. EXAFS was used to study the metal-support interactions. Structures formed on almost fully dehydroxylated MgO by $HRe(CO)_5$, and on MgO by $Ir_4(CO)_{12}$, were studied. A metal-oxygen distance of 2.15 Å holds in for the metal-support interface in oxide-supported metal clusters following reduction in H_2 above 450 C; for reduction below 350 C, the distance is 2.5–2.7 Å.

1248 (DOE/ER/14121–2) **Fundamental studies of reactive intermediates in homogeneous catalysis.** Purdue Univ., Lafayette, IN (United States). Dept. of Chemistry. [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14121. Order Number DE94000971. Source: OSTI; NTIS; GPO Dep.

The studies involve dissociation of $Fe(CO)_n^-$, $Ni(CO)_n^-$, and other carbonyl anions; decarboxylation of $(CO)_4FeCOOH^-$ to form CO_2 and $(CO)_4FeH^-$ in the water gas shift reaction; gas-phase bimolecular reactions of carbonyl anions and O_2; reaction of O_2 with $CpMn(CO)_2^-$; gas-phase chemistry of fullerene anions; and gas-phase thermochemistry of bicarbonate ion, bisulfite ion, and their conjugate acids (sulfonate ion was produced).

1249 (DOE/PC/89785–13) **The single electron chemistry of coals: [Quarterly] report, October 1–December 31, 1992.** Larsen, J.W.; Eskay, T.P. Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry. [1992]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89785. Order Number DE94001954. Source: OSTI; NTIS; GPO Dep.

Radical cation generation in coal may make possible depolymerization at low temperature. This possibility was investigated using single molecules containing functional groups common in coals. Single- electron oxidations of 4,4′-dimethoxybibenzyl (DMBB) by Fe(III) (1,10-phenanthroline)$_3$(ClO_4)$_3$, in refluxing CH_3CN, gave incomplete mass balances; an attempt was made to identify the additional products. Part of these products were deduced to be dimer, p-methoxybenzylated dimer of DMBB; mono, di, and tri-p-methoxybenzylated DMBB. Similar oxidations in CH_2Cl_2 and sulfolane solvents gave similar results. Attempts to use other solvents were unsuccessful.

1250 (DOE/PC/92106–T3) **Charge distribution analysis of catalysts under simulated reaction conditions: Third quarterly technical progress report, March 31–June 30, 1993.** Freund, F. Surface/Interface, Inc., Mountain View, CA (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92106. Order Number DE94002176. Source: OSTI; NTIS; GPO Dep.

The equipment is described: CDA test cell, data acquisition, thermocouple, etc.

1251 (INIS-mf–13718) **Study of iron exchanged zeolites by Moessbauer effect and electron spin resonance spectroscopy.** Aguirre Campuzano, C.E. Universidad Autonoma del Estado de Mexico, Toluca (Mexico). Facultad de Quimica. 1993. 76p. (In Spanish). Order Number DE94605138. Source: OSTI; NTIS (US Sales Only); INIS.

Crystalline iron exchanged NaY zeolites, prepared from aqueous solutions and calcined at atmospheric conditions, have been studied and characterized by XRD, Moessbauer and EPR spectroscopies and TGA analysis. Three iron sites are clearly distinguished from Moessbauer and EPR measurements. Firstly, characteristic Moessbauer and EPR spectra may arise from framework sites, suggesting that Fe has substituted Al. It is also found that their spectroscopic signals are not intensity affected by thermal treatments. Secondly, a Moessbauer doublet which may arise from octahedral sites in the large cavity of the zeolite, shows however, that this doublet and its EPR signal are intensity temperature affected. An additional line broadening is observed on the low velocity line of this doublet, Thirdly, characteristic Moessbauer and EPR signals, which are also intensity temperature dependent have

been associated to accluded material, where the Moessbauer doublet presents the line broadening effect before mentioned. Such line broadening effect may be due to perturbing signals from iron ions in tetrahedral sites. Finally, it has been observed that during calcination of the FeY zeolites, the three characteristic EPR signals for the three iron sites, do not increase at the expenses of the other. A result that may suggest a strong bonding between Fe-site of the Y zeolite, irrespective of the iron source. (Author).

1252 (IS-T–1645) **Sulfur-bonded thiophenes in organometallic rhenium complexes and adsorption of isocyanides on gold.** Robertson, M.J. Ames Lab., IA (United States). Aug 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE93041126. Source: OSTI; NTIS; GPO Dep.

This dissertation contains results of research conducted in two different areas: (1) organometallic synthesis and reactivity, and (2) organometallic surface chemistry. In the synthesis and reactivity studies, sulfur coordination of thiophene and benzo[b]thiophene to the metal center in organometallic rhenium complexes is examined. In the surface chemistry studies, diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS) is used to analyze the adsorption of several isocyanides on the surface of gold powder. Results are compared and contrasted to known organometallic chemistry.

1253 (JINR-E–1-92-518) **Pentanol-based target material with polarized protons.** Bunyatova, E.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 7p. Order Number DE94605139. Source: OSTI; NTIS (US Sales Only); INIS.

1-pentanol is a promising material for a target with polarized protons owing to its high resistance to radiation damage. To develop the target, the solutions of 1-pentanol or 2-pentanol with complexes of pentavalent chromium ware investigated. The material based EHBA-Cr(V) solution in a glass-like matrix, consisting of 1-pentanol, 3-pentanol and 1,2-propanediol, was proposed as a target material. It was investigated by the electron paramagnetic resonance and differential scanning calorimetry methods. 24 refs.; 3 figs.; 1 tab.

1254 (LA-UR–93-3333) **Low temperature absorption spectra and ground state electronic structure of tetrakis(2,6-di-tert-butylphenoxide)uranium(IV).** Berg, J.M. Los Alamos National Lab., NM (United States). 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–16: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000774. Source: OSTI; NTIS; GPO Dep.

The optical spectroscopy of the homoleptic U(IV) aryloxide compound $U(O\text{-}2,6\text{-}t\text{-}Bu_2C_6H_3)_4$ could give unique insight into actinide electronic structure because the complex has unusually high symmetry. Its synthesis and characterization were described in a recent paper. The characterization included presentation of several optical spectra in solution accompanied by a brief, qualitative discussion of the molecular properties that give rise to the observed features. This paper presents optical absorption data on microcrystalline solid samples at low temperature. Discussion of the data focuses generally on effect of the ligands on $5f^2$ electronic configuration of central U(IV) ion and specifically on properties of the ground state and the lowest lying electronic state.

1255 (LBL–34410) **Water-enhanced solvation of organics.** Lee, J.H. Lawrence Berkeley Lab., CA (United States). Jul 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE93040297. Source: OSTI; NTIS; GPO Dep.

Water-enhanced solvation (WES) was explored for Lewis acid solutes in Lewis base organic solvents, to develop cheap extract regeneration processes. WES for solid solutes was determined from ratios of solubilities of solutes in water-sat. and low-water solvent; both were determined from solid-liquid equilibrium. Vapor-headspace analysis was used to determine solute activity coefficients as function of organic phase water concentration. WES magnitudes of volatile solutes were normalized, set equal to slope of log γ_s vs x_w/x_s curve. From graph shape $\Delta(\log \gamma_s)$ represents relative change in solute activity coefficient. Solutes investigated by vapor-headspace analysis were acetic acid, propionic acid, ethanol, 1,2-propylene glycol, 2,3-butylene glycol. Monocarboxylic acids had largest decrease in activity coefficient with water addition followed by glycols and alcohols. Propionic acid in cyclohexanone showed greatest water-enhancement $\Delta(\log \gamma_{acid})/\Delta(x_w/x_{acid}) = -0.25$. In methylcyclohexanone, the decrease of the activity coefficient of propionic acid was −0.19. Activity coefficient of propionic acid in methylcyclohexanone stopped decreasing once the water reached a 2:1 water to acid mole ratio, implying a stoichiometric relation between water, ketone, and acid. Except for 2,3-butanediol, activity coefficients of the solutes studied decreased monotonically with water content. Activity coefficient curves of ethanol, 1,2-propanediol and 2,3-butanediol did not level off at large water/solute mole ratio. Solutes investigated by solid-liquid equilibrium were citric acid, gallic acid, phenol, xylenols, 2-naphthol. Saturation concentration of citric acid in anhydrous butyl acetate increased from 0.0009 to 0.087 mol/L after 1.3 % (g/g) water co-dissolved into organic phase. Effect of water-enhanced solvation for citric acid is very large but very small for phenol and its derivatives.

1256 (UCRL-JC–114161) **X-ray Absorption Spectroscopy of the Rare Earth orthophosphates.** Shuh, D.K. (Lawrence Berkeley Lab., CA (United States)); Terminello, L.J.; Boatner, L.A.; Abraham, M.M. Lawrence Livermore National Lab., CA (United States); Lawrence Berkeley Lab., CA (United States); Oak Ridge National Lab., TN (United States). Jun 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ;AC03-76SF00098 ;AC05-84OR21400. (CONF-930405–47: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94001043. Source: OSTI; NTIS; INIS; GPO Dep.

X-ray Absorption Spectroscopy (XAS) of the Rare Earth (RE) 3d levels yields sharp peaks near the edges as a result of strong, quasi-atomic $3d^{10}4f^n \rightarrow 3d^{9}4f^{n+1}$ transitions and these transitions exhibit a wealth of spectroscopic features. The XAS measurements of single crystal $REPO_4$ (RE = La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Er) at the 3d edge were performed in the total yield mode at beam line 8-2 at the Stanford Synchrotron Radiation Laboratory (SSRL). The XAS spectra of the RE ions in the orthophosphate matrix generally resemble the XAS of the corresponding RE metal. This is not unexpected and emphasizes the major contribution of the trivalent state to the electronic transitions at the RE 3d edges. These spectra unequivocally identify the transitions originating from well-characterized RE cores and correlate well with previous theoretical investigations.

1257 (WSRC-MS–93-169) **Air-nitric acid destructive oxidation of organic wastes.** Smith, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9309146–2: 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management, Atlanta, GA (United States), 27-29 Sep 1993). Order Number DE93041121. Source: OSTI; NTIS; INIS; GPO Dep.

Many organic materials have been completely oxidized to CO_2, CO, and inorganic acids in a 0.1M HNO_3/14.8M H_3PO_4 solution with air sparging. Addition of 0.001M Pd_{+2} reduces the CO to near 1% of the released carbon gases. To accomplish complete oxidation the solution temperature must be maintained above 130–150°C. Organic materials quantitatively destroyed include neoprene, cellulose, EDTA, TBP, tartaric acid, and nitromethane. The oxidation is usually complete in a few hours for soluble organic materials. The oxidation rate for non-aliphatic organic solids is moderately fast and surface area dependent. The rate for aliphatic organic compounds (polyethylene, PVC, and n-dodecane) is relatively very slow. This is due to the large energy required to abstract a hydrogen atom from these compounds, 99 kcal/mole. The combination of $NO_2\cdot$ and H· to produce HNO_2 releases only 88 kcal/mole. Under conditions of high $NO_2\cdot$ concentration it should be possible to oxidize these aliphatic compounds.

1258 (Y/DV–1268) **Dealing with the chlorinated solvent situation at the Oak Ridge Y-12 Plant.** Thompson, L.M.; Simandl, R.F. Oak Ridge Y-12 Plant, TN (United States). 2 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-9308150–8: Environmentally

conscious manufacturing congress '93, Arlington, VA (United States), 30 Aug - 1 sep 1993). Order Number DE94001949. Source: OSTI; NTIS; INIS; GPO Dep.

Recent events regarding health and environmental problems associated with the use of chlorinated solvents have prompted the Oak Ridge Y-12 Plant to investigate substitutes for these materials. Since 1987, the purchase of chlorinated solvents at the Y-12 Plant has been reduced by 92%. This has been accomplished by substituting chlorinated solvent degreasing with ultrasonic aqueous detergent cleaning and by substituting chlorinated solvents with less toxic, environmentally friendly solvents for hand-wiping applications. Extensive studies of cleaning ability, compabitility, and effects on welding, bonding, and painting have been conducted to gain approval for use of these solvents. Toxicity and waste disposal were also assessed for the solvents.

4005 Photochemistry

Refer also to citation(s) 1320, 1345, 1350, 2536, 2544, 2546

1259 (BNL–48923, pp. 16-19) **Combustion-related studies using weakly-bonded complexes.** Beaudet, R.A. (Univ. of Southern California, Los Angeles (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Binary van der Waals complexes involving species of interest to combustion research are prepared in supersonic free-jet expansions, and their photochemical and photophysical properties are probed by using IR tunable diode laser (TDL) spectroscopy. In the first phase, geometries and other molecular properties are being determined from vibration-rotational spectra. In the second phase, these complexes will be used as precursors to study photoinitiated reactions in precursor geometry limited environments. Two complementary classes of binary complexes are being investigated. The first involves molecular oxygen and hydrogen containing constituents (e.g. O_2-HCN, O_2-HF, O_2-HCl, O_2-HBr, O_2-HI and O_2-hydrocarbons). These species are interesting candidates for study since upon photodissociating the hydride portion, the reaction H and O_2 via the vibrationally excited HO_2 intermediate can conceivably be studied, (e.g. BrH-O_2 + hv(193 nm) → Br-H-O_2 → Br + HO_2 → Br + OH + O). High resolution IR spectroscopy of such complexes have not been obtained previously and the structural information deriving from IR spectra is certainly very useful for better designing and understanding photoinitiated reactions that occur in these complexes.

1260 (BNL–48923, pp. 39-42) **Reaction product imaging.** Chandler, D.W. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Over the past few years the author has investigated the photochemistry of small molecules using the photofragment imaging technique. Bond energies, spectroscopy of radicals, dissociation dynamics and branching ratios are examples of information obtained by this technique. Along with extending the technique to the study of bimolecular reactions, efforts to make the technique as quantitative as possible have been the focus of the research effort. To this end, the author has measured the bond energy of the C-H bond in acetylene, branching ratios in the dissociation of HI, the energetics of CH_3Br, CD_3Br, C_2H_5Br and C_2H_5OBr dissociation, and the alignment of the CD_3 fragment from CD_3I photolysis. In an effort to extend the technique to bimolecular reactions the author has studied the reaction of H with HI and the isotopic exchange reaction between H and D_2.

1261 (BNL–48923, pp. 58-61) **The photodissociation and reaction dynamics of vibrationally excited molecules.** Crim, F.F. (Univ. of Wisconsin, Madison (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This research determines the nature of highly vibrationally excited molecules, their unimolecular reactions, and their photodissociation dynamics. The goal is to characterize vibrationally excited molecules and to exploit that understanding to discover and control their chemical pathways. Most recently the author has used a combination of vibrational overtone excitation and laser induced fluorescence both to characterize vibrationally excited molecules and to study their photodissociation dynamics. The author has also begun laser induced grating spectroscopy experiments designed to obtain the electronic absorption spectra of highly vibrationally excited molecules.

1262 (BNL–48923, pp. 81-85) **Laser photoelectron spectroscopy of ions.** Ellison, G.B. (Univ. of Colorado, Boulder (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract FG02-87ER13695. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

During the last year the author has (a) completed a review article that critically contrasts three methods to measure R-H bond energies, (b) finished a spectroscopic study of the phenylnitrene anion, and (c) successfully completed an overhaul of the light source of the photodetachment spectrometer. The new light source is based on an Ar III laser that provides approximately 100 W of 3.531 eV photons.

1263 (BNL–48923, pp. 98-101) **Spectroscopic and dynamical studies of highly energized small polyatomic molecules.** Field, R.W. (Massachusetts Institute of Technology, Cambridge (United States)); Silbey, R.J. Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract FG02-87ER13671. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The authors have initiated a program to perform spectroscopic and dynamic studies of small molecules. Large amplitude motions in excited acetylene were discussed along with plans to record the dispersed fluorescence (DF) and the stimulated emission pumping (SEP) spectra. SEP spectra were reported for the formyl radical. A Fourier transform spectrometer was discussed with respect to its ability to probe the structure of radicals. This instrument is capable of performing studies using various techniques such as magnetic rotation spectroscopy and sub-Doppler sideband-OODR Zeman (SOODRZ) spectroscopy.

1264 (BNL–48923, pp. 102-105) **Laser studies of chemical reaction and collision processes.** Flynn, G. (Columbia Univ., New York, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This work has concentrated on several interrelated projects in the area of laser photochemistry and photophysics which impinge on a variety of questions in combustion chemistry and general chemical kinetics. Infrared diode laser probes of the quenching of molecules with "chemically significant" amounts of energy in which the energy transferred to the quencher has, for the first time, been separated into its vibrational, rotational, and translational components. Probes of quantum state distributions and velocity profiles for atomic fragments produced in photodissociation reactions have been explored for iodine chloride.

1265 (BNL–48923, pp. 127-130) **Dynamics of synchrotron VUV-induced intracluster reactions.** Grover, J.R. (Brookhaven National Laboratory, Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research*

conference. 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Photoionization mass spectrometry (PIMS) using the tunable vacuum ultraviolet radiation available at the National Synchrotron Light Source is being exploited to study photoionization-induced reactions in small van der Waals mixed complexes. The information gained includes the observation and classification of reaction paths, the measurement of onsets, and the determination of relative yields of competing reactions. Additional information is obtained by comparison of the properties of different reacting systems. Special attention is given to finding unexpected features, and most of the reactions investigated to date display such features. However, understanding these reactions demands dynamical information, in addition to what is provided by PIMS. Therefore the program has been expanded to include the measurement of kinetic energy release distributions.

1266 (BNL–48923, pp. 135-137) **High-resolution spectroscopic probes of collisions and half-collisions.** Hall, G.E. (Brookhaven National Laboratory, Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Research in this program explores the dynamics of gas phase collisions and photodissociation by high-resolution laser spectroscopy. Simultaneous state and velocity detection frequently permits a determination of scalar or vector correlations among products. The correlated product distributions are always more informative, and often easier to interpret than the uncorrelated product state distributions. The authors have recently built an apparatus to record transient absorption spectra with 50 nS time resolution and 20 MHz frequency resolution using a single frequency Ti:sapphire laser. The photodissociation of NCCN and C_2H_5SCN at 193 nm is discussed.

1267 (BNL–48923, pp. 145-148) **Femtosecond laser studies of ultrafast intramolecular processes.** Hayden, C. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The goal of this research is to better understand the detailed mechanisms of chemical reactions by observing, directly in time, the dynamics of fundamental chemical processes. In this work femtosecond laser pulses are used to initiate chemical processes and follow the progress of these processes in time. The authors are currently studying ultrafast internal conversion and subsequent intramolecular relaxation in unsaturated hydrocarbons. In addition, the authors are developing nonlinear optical techniques to prepare and monitor the time evolution of specific vibrational motions in ground electronic state molecules.

1268 (BNL–48923, pp. 167-168) **Photochemistry of materials in the stratosphere.** Johnston, H.S. (Lawrence Berkeley Laboratories, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract AC03-76SF00098. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This research is concerned with global change in the atmosphere, including photochemical modeling and, in the past, experimental gas-phase photochemistry involving molecular dynamics and laboratory study of atmospheric chemical reactions. The experimental work on this project concluded in August 1991, but there is a back-log of several journal articles to be written and submitted for publication. The theoretical work involves photochemical modeling in collaboration with Lawrence Livermore National Laboratory (LLNL) and advising the Upper Atmosphere Research Program on Atmospheric Effects of Stratospheric Aircraft, National Aeronautics and Space Administration (NASA).

1269 (BNL–48923, pp. 229-231) **Flash photolysis-shock tube studies.** Michael, J.V. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Even though this project in the past has concentrated on the measurement of thermal bimolecular reactions of atomic species with stable molecules by the flash or laser photolysis-shock tube (FP- or LP-ST) method using atomic resonance absorption spectrometry (ARAS) as the diagnostic technique, during the past year the authors have concentrated on studies of the thermal decompositions of selected chlorocarbon molecules. These studies are necessary if the degradation of chlorine containing organic molecules by incineration are to be understood at the molecular level. Clearly, destruction of these molecules will not only involve abstraction reactions, when possible, but also thermal decomposition followed by secondary reactions of the initially formed atoms and radicals. Studies on the thermal decomposition of CH_3Cl are complete, and the curve-of-growth for Cl-atom atomic resonance absorption has been determined. The new thermal decomposition studies are similar to those already reported for CH_3Cl.

1270 (BNL–48923, pp. 241-244) **Photochemical reaction dynamics.** Moore, B.C. (Lawrence Berkeley Laboratory, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The purpose of the program is to develop a fundamental understanding of unimolecular and bimolecular reaction dynamics with application in combustion and energy systems. The energy dependence in ketene isomerization, ketene dissociation dynamics, and carbonyl substitution on organometallic rhodium complexes in liquid xenon have been studied. Future studies concerning unimolecular processes in ketene as well as energy transfer and kinetic studies of methylene radicals are discussed.

1271 (BNL–48923, pp. 250-253) **Vacuum ultraviolet photoionization and photodissociation of polyatomic molecules and radicals.** Ng, C.Y. (Iowa State Univ., Ames (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

In the past decade, tremendous progress has been made in understanding the photodissociation (PD) dynamics of triatomic molecules. However, the PD study of radicals, especially polyatomic radicals, has remained essentially an unexplored research area. Detailed state-to-state PD cross sections for radicals in the UV and VUV provide challenges not only for dynamical calculations, but also for ab initio quantum chemical studies. The authors have developed a laser based pump-probe apparatus for the measurement of absolute PD cross sections for CH_3S and HS is summarized.

1272 (BNL–48923, pp. 343-349) **Gas-phase chemical dynamics.** Weston, R.E. Jr. (Brookhaven National Laboratory, Upton, NY (United States)); Sears, T.J.; Preses, J.M. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Research in this program is directed towards the spectroscopy of small free radicals and reactive molecules and the state-to-state dynamics of gas phase collision, energy transfer, and photodissociation phenomena. Work on several systems is summarized here.

1273 (BNL–48923, pp. 350-353) **VUV studies of molecular photofragmentation dynamics.** White, M.G. (Brookhaven National Laboratory, Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA

(United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

State-resolved, photoion and photoelectron methods are used to study the neutral fragmentation and ionization dynamics of small molecules relevant to atmospheric and combustion chemistry. Photodissociation and ionization are initiated by coherent VUV radiation and the fragmentation dynamics are extracted from measurements of product rovibronic state distributions, kinetic energies and angular distributions. The general aim of these studies is to investigate the multichannel interactions between the electronic and nuclear motions which determine the evolution of the photoexcited "complex" into the observed asymptotic channels.

1274 (BNL–48923, pp. 354-357) **Reactions of small molecular systems.** Wittig, C. (Univ. of Southern California, Los Angeles, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This DOE program remains focused on small molecular systems relevant to combustion. Though a number of experimental approaches and machines are available for this research, the authors' activities are centered around the high-n Rydberg time-of-flight (HRTOF) apparatus in this laboratory. One student and one postdoc carry out experiments with this machine and also engage in small intra-group collaborations involving shared equipment. This past year was more productive than the previous two, due to the uninterrupted operation of the HRTOF apparatus. Results were obtained with CH_3OH, CH_3SH, Rg-HX complexes, HCOOH, and their deuterated analogs where appropriate. One paper is in print, three have been accepted for publication, and one is under review. Many preliminary results that augur well for the future were obtained with other systems such as HNO_3, HBr-HI complexes, toluene, etc. Highlights from the past year are presented below that display some of the features of this program.

1275 (DOE/ER/13664–4) **[Fundamental studies in oxidation-reduction in relation to water photolysis]: Progress report, June 26, 1989–November 1, 1990.** Hurst, J.K. Oregon Graduate Center, Beaverton, OR (United States). [1990]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER13664. Order Number DE94002312. Source: OSTI; NTIS; GPO Dep.

Objective is to solve problems in photoredox catalysis pertinent to developing membrane-base photoconversion/photostorage systems. The research is divided into: Physical studies (light scattering) on viologen-doped vesicles, transmembrane oxidation-reduction mechanisms, interfacial charge recombination, water oxidation catalysts.

1276 (DOE/ER/13914–16) **Photochemical approaches to conversion of light to electricity or fuel: Progress report, December 1, 1992–November 30, 1993.** Wrighton, M.S. Massachusetts Inst. of Tech., Cambridge, MA (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER13914. Order Number DE94001650. Source: OSTI; NTIS; GPO Dep.

Objective is to understand photochemical and photophysical processes, and to develop photochemical systems for converting light to electricity or fuel: Orientation of multi-component redox polymers on surfaces; excited state electron transport in multi-component molecules prepared via ring opening metathesis polymerization; molecular materials for solid state photovoltaics. Rhenium complexes were covered.

1277 (LBL–34481) **High-resolution soft x-ray photoionization studies of selected molecules.** Hudson, E.A. Lawrence Berkeley Lab., CA (United States). Aug 1993. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94000568. Source: OSTI; NTIS; INIS; GPO Dep.

Near-edge soft x-ray photoionization spectra were measured for CO, SF_6, H_2S, and D_2S in the gas phase, using the Free University of Berlin plane-grating SX-700-II monochromator at the synchrotron radiation source BESSY. Photoionization spectra of carbon monoxide were measured near the carbon and oxygen K edges. Vibrational spacings and bond lengths are derived for several resonances. Results are consistent with equivalent-core model and indicate the different influences of the carbon and oxygen ls core holes. Corresponding spectra of H_2CO and D_2CO were also measured. Assignment of complex vibrational structure in valence-shell and Rydberg resonances is facilitated by comparison of spectra for the two isotopic species. Geometric and vibrational parameters are derived for several carbon 1s core-excited states. Isotopic shifts are observed in the energies and linewidths oi some core-excited states. Sulfur hexafluoride photoionization spectra, measured near the sulfur $L_{2,3}$ edges, show several series of weak, narrow Rydberg resonances. High resolution and good counting statistics allow a complete assignment of these states. Lineshapes of the broad inner-well resonances are analyzed to establish the magnitudes of vibrational and lifetime broadening in these states. Spectra of the H_2S and D_2S molecules were also measured near the sulfur $L_{2,3}$ edges. Besides lower-energy transitions to inner-well states, a complex manifold of overlapping Rydberg resonances is observed. The rich fine structure of these states arises mainly from removal of orbital degeneracies in molecular field. Additional structure due to vibrational excitations in the final state is identified by comparison of the spectra for the two isotopic species.

4006 Radiation Chemistry

Refer also to citation(s) 330, 756, 1539, 1642, 1714, 2592

1278 (INIS-mf–13731, pp. 74) **Irradiation of PMMA with high energy light ions: the depth distribution for volatile reaction-product emission.** Fink, D. (Hahn-Meitner-Institut Berlin GmbH (Germany)); Schmoldt, A.; Chadderton, L.T. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EVAPORATION/pmma; EVAPORATION/spatial distribution; PMMA/light ions; PMMA/radiation effects; DEGASSING; DEPTH; ELECTRONS; EMISSION; ENERGY TRANSFER; EVAPORATION; PMMA; IRRADIATION; LITHIUM; MASS SPECTROSCOPY; MEV RANGE 10-100

1279 (INIS-mf–13731, pp. 190-191) **Study on effect of neutron radiation on CR-39 and surface of CR-39.** Zhang Guangli (Dept. of Chermistry, Beijing Univ. (China)); Feng Yushui. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/polymers; POLYMERS/chemical radiation effects; POLYMERS/neutrons; CHEMICAL BONDS; POLYMERS; NEUTRONS; SURFACES

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Refer also to citation(s) 165, 166, 1025, 1254

1280 (ANL/CHM/CP–79022) **Linear and nonlinear spectroscopy of tetravalent actinide ions in CeF_4.** Liu, G.K.; Jursich, G.; Huang, J.; Beitz, J.V.; Williams, C.W. Argonne National Lab., IL (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930905–14: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94001280. Source: OSTI; NTIS; GPO Dep.

This paper reports laser spectroscopy studies on the tetravalent actinide ions Bk^{4+} and Cf^{4+} doped into CeF_4. Fluorescence line narrowing (FLN) and spectral hole burning (SHB) were applied to unravel the complex 5f-state spectra that arise from inhomogeneous line broadening and the presence of two intrinsic metal ion

sites. When a persistent spectral hole was burned in an inhomogeneously broadened zero phonon line of 1 metal atom % Cf^{4+} in CeF_4, satellite spectral holes were also observed in other inhomogeneously broadened lines of Cf^{4+}. In the FLN spectra of 0.1 metal atom% Bk^{4+} in CeF_4, a linear relation was observed between excitation laser photon energy and energies of Bk^{4+} emission lines. This can be understood in terms of one limit of a general model of inhomogeneous broadening, namely the limit in which there is a one-to-one correspondence between optical transition energy and local structure in a disordered system.

1281 (CEA-CONF–11422) **Mechanisms of the rapid dissolution of plutonium dioxide in acidic media under oxidizing or reducing conditions.** Madic, C.; Berger, P.; Machuron-Mandard, X. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1990. 12p. (CONF-900846–: International symposium to commemorate the 50th anniversary of discovery of transuranium elements, Washington, DC (United States), 26-31 Aug 1990). Order Number DE94604132. Source: OSTI; NTIS (US Sales Only); INIS.

Until recently plutonium dioxide was known to be among the metallic oxides most difficult to dissolve. This property is understandable given the free energy of the dissolution reaction (ΔG^0) in acidic noncomplexing media (ΔG^0 = 32.04 kJ/mol). Thermodynamic calculations predict that PuO_2 will dissolve under oxidizing or reducing conditions. The oxidizing dissolution, leading to Pu(VI) ion in solution, is easy to perform with a strong oxidant like Ag(II). The mechanism of the oxidizing dissolution of PuO_2 was investigated by using carbon paste electrochemistry (CPE) and ^{18}O labeling. PuO_2 can also be dissolved in acidic solution if the redox potential of the mixture is low (e.g., Cr^{2+}, V^{2+}, or U^{3+} as reducing agents). The kinetics of the heterogeneous reducing dissolution of PuO_2 with Cr^{2+} were investigated and the reaction mechanism was determined by ^{18}O labeling. All the results will be presented and discussed in the context of minimizing the amount of plutonium-contaminated solid wastes in the nuclear fuel cycle. 9 figs., 17 refs.

1282 (CNIC–00627) **Permeability, solubility and diffusivity of hydrogen isotopes through some materials.** Shan Changqi (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy). China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 18p. (In Chinese). (IAE–0104.). Order Number DE94604136. Source: OSTI; NTIS (US Sales Only); INIS.

The permeability, solubility and diffusivity of tritium through metals, ceramics, glasses, elastomers and polymeric materials were studied. The data about solubility, diffusivity and permeability of hydrogen isotopes through these materials measured by others and the empirical formulas calculating these parameters varying with temperature changing are also presented. In addition, the mechanism of diffusion and permeation of tritium through metals, ceramics and glasses are discussed. The diffusivity and permeability of tritium and hydrogen through 316 stainless steel are summarized.

1283 (CNIC–00661) **Development of ^{125}I-leukotriene B_4 radio-immunoassay and its clinical applications.** Wang Zhaoyue (Suzhou Medical Coll., JS (China)); He Yang; Chen Dechun; Ruan Changgeng. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 8p. (In Chinese). (SMC–0083.). Order Number DE94604137. Source: OSTI; NTIS (US Sales Only); INIS.

LTB_4 was extracted from porcine blood with the help of HPLC. The antiserum was raised by immunizing rabbits with LTB_4 which has been conjugated with bovine serum albumin by mixed anhydride method method. The titer of the anti-body was 1:7000 and the affinity coefficient was 2.1 x 10^9 L/M. Its cross reactions with LTA_4, LTC_4, LTD_4 and other arachidonic acid metabolites were 0.4 $\approx$ 6.4%.The ^{125}I-histamine-LTB_4 was prepared by using chloramine T procedure. The minimum detectable limit was 25 pg/tube. The recovery rate was 84.2 $\approx$ 113%. The intra- and inter-assay coefficient of variation were 5.2% and 9.7% respectively. The amount of LTB_4 produced by normal human PMNL which were stimulated by ionophore A23187 and arachidonic acid was 695.5 $\pm$ 329.7 pg/10^6 cells. PMNL of patients with various acute leukemias and CML generated an increased quantities of LTB_4, TXB_2 and 6-keto-$PGF_{1\alpha}$. LTB_4 produced by PMNL also showed an increasing tendency in both cerebral thrombosis and acute myocardial infarction, but was not altered in cerebral hemorrhage of non-infarction coronary disease.

1284 (CNIC–00673) **Hypersensitive transition spectrum of f-element and coordination structure.** Cao Xuan (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Song Chongli; Zhu Youngjun. China Nuclear Information Centre, Beijing, BJ (China). Oct 1992. 12p. (In Chinese). (TSHUNE–0053.). Order Number DE94604133. Source: OSTI; NTIS (US Sales Only); INIS.

Some f-f transitions of Ln(An) metallic ions have particular supersensitivity to the change of coordination environments. This is called super-sensitive transitions. Based on the irreducible tensor operator method, a computation model and corresponding computer program for calculating the hypersensitive transition spectrum of f-element were developed. By comparing the theoretical spectra of all possible coordination structures with experimental one, the possible coordination structures of complex can be determined. The coordination structures of Nd^{3+}, Er^{3}+ hydrate and their extraction complex with H(DEHP) were successfully determined by this method, and the experimental spectra were also assigned.

1285 (CNIC–00683) **The preparation of 32 CRMS solutions including U and Th.** Han Yuexiang (Beijing Research Inst. of Chemical Engineering Metallurgy, CNNC (China)); Xue Jingxia; Liu Fuyun; Li Daling; Liu Guiying; Liu Yansheng. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 6p. (In Chinese). (BICM–0007.). Order Number DE94604134. Source: OSTI; NTIS (US Sales Only); INIS.

32 CRMS (certified reference material solution) including U and Th were prepared with the certified value 100 μg/mL. The whole procedure including homogeneity test, stability check and certification was strictly performed according to the stipulation of Technical Norm of Primary Reference Material. The homogeneity of solutions was tested by F test method and the results showed that all solutions are homogeneous. The stability of the solutions was demonstrated by t test with $t \leq t_{0.05(n-1)}$, and was over one year. The volumetric method was used for certification except for Si to which gravimetric method was used. The total uncertainties of certified values for these solutions are not greater than +- 2%.

1286 (CONF-930907–12) **Sensitivity of calculations of ^{252}Cf-source-driven noise analysis measurements to cross sections for aqueous fissile solutions.** Valentine, T.E. (Oak Ridge Associated Universities, Inc., TN (United States)); Mihalczo, J.T. Oak Ridge National Lab., TN (United States); Oak Ridge Associated Universities, Inc., TN (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;AC05-76OR00033. From ANS topical meeting on physics and methods in criticality safety; Nashville, TN (United States); 19-23 Sep 1993. Order Number DE93041050. Source: OSTI; NTIS; INIS; GPO Dep.

Previous experiments have shown large changes in measured parameters such as the coherences and ratio of spectral densities for small changes in the measured configuration of fissile material and for small changes in k. This sensitivity was investigated by a variant of the Monte Carlo neutron transport code KENO-V.a, which calculates the time sequences of pulses at two detectors near a fissile assembly from the fission chain multiplication process initiated by a ^{252}Cf source in or near the fissile assembly. This code directly calculates the noise analysis data from the ^{252}Cf-source-driven neutron noise measurement method. Direct calculation of the experimental observables by the Monte Carlo method allows the benchmarking of calculational methods and cross sections. These calculations have shown a higher sensitivity of noise-measured quantities to cross sections and calculational methods than the neutron multiplication factor for aqueous fissile solutions. For example, the calculation with ENDF/B-IV cross sections yields a value of the coherence $\gamma_{23}{}^2$ 300% larger at low frequency than that from the Hansen-Roach cross sections. The coherence between detectors is a factor of 67 more sensitive to cross sections than the neutron multiplication factor, and this results from the coherence at low k being proportional to the fourth power of ($k/\Delta k$). This increased sensitivity to calculational methods means that as far as validating calculational methods, a subcritical experiment at a k $\approx$ 0.9 by the ^{252}Cf-source-driven noise analysis method may

be more useful than an experiment at k ≈ 1. The noise-measured parameters can easily be obtained from measurements with an accuracy of ±1% or less, and the precision of the Monte Carlo calculation of these quantities can also be ±1% or less.

1287 (EUR–14690, pp. 3-14) **Studies on humic acid labelling.** Carlsen, L. (National Environmental Rsearch Institute, Roskilde (Denmark)); Lassen, P.; Warwick, P.; Randall, A. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

It is well known that humic and fulvic acids are able to complex polyvalent metal ions, e.g. radionuclides, leading to soluble complexes of significant strength, thereby decreasing the sorption of these compounds to soils and sediments. Obviously, the interaction of metal ions with humic materials may significantly influence the availability and transport of the pollutants in the environment. Typically, studies along these lines have focused almost exclusively on the pollutants, whereas the actual role of the humic material has been elucidated only indirectly. In order directly to study the behaviour of the naturally occurring organic macro molecules in relation to the environmental fate of radionuclides, radio-labelled humic-and fulvic acids can advantageously be applied. Radio-labels such as carbon-14 and iodine-125 have successfully been covalently incorporated in humic- and fulvic acids. The paper discuss the labelling of humic substances as well as preliminary migration studies. 25 refs., 1 tab.

1288 (INIS-BR–3148, pp. 467-469) **^{123} I production using CV-28 cyclotron from IPEN-CNEN/SP.** Mestnik, S.A.C. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Mengatti, J.; Nieto, W.; Yanagawa, S.I.; Sumiya, L.C.A.; Silva, C.P.G.; Osso Junior, J.A. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The main conditions for iodine 123 production by ^{124} Te (p,2 n)^{123} I reaction were presented, using the cyclotron CV-28 at IPEN-CNEN/SP, with protons of E max = 24 MeV. Two types of targets (Te O_2 and Te O_2 + 2% Al_2O_3) and the influence of Al_2O_3 in iodine release were studied. After the selection, the ^{124} Te O_2 (96,2%) target, was melted in platinum support and irradiated with proton current until 12 mu A. The separation of ^{123} I was made by dry distillation, using induction furnace and O_2 atmosphere. (C.G.C.).

1289 (INIS-BR–3148, pp. 470-473) **Study for thallium-201 preparation at IPEN-CNEN/SP.** Fernandes, L. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Yanagawa, S.T.I.; Mengatti, J.; Nakanishi, C.; Acar, M.E.D. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The thallium-201 was obtained in cyclotron by irradiating of natural targets from thallium and mercury with protons. A study of these preparation methods of thallium-201 was made, since the preparation of targets, the chemical separation techniques, until the quality control of end solution from ^{201} Tl Cl and the experiments for thallium recovery. The results were presented showing the impossibility of production thallium-201 at IPEN-CNEN/SP by these two methods, due to the cost of enrichment element and the maximum energy of protons in cyclotron. (C.G.C.).

1290 (INIS-BR–3148, pp. 474-477) **Yield analysis of radioisotope production obtained in cyclotron with protons of E ≤ 24 and 30 MeV for using in nuclear medicine.** Mengatti, J. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Mestnik, S.A.C.; Gasiglis, H.T. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A comparative study from a theoretical yield of main radioisotope production, used in nuclear medicine is presented. The obtained values in cyclotron-C-V- 28, Ep ≤24 MeV are compared with the possible values of a cyclotron with Ep=30 MeV. (C.G.C.).

1291 (INIS-BR–3148, pp. 478-479) **The present situation of radioisotope production in cyclotron CV-28 at IEN.** Braghirolli, A.M. (Instituto de Engenharia Nuclear (IEN), Rio de Janeiro, RJ (Brazil)); Silva, A.G. da; Santos, D.F. dos; Almeida, G.L. de; Britto, J.L.Q. de; Osso Junior, J.A.; Bastos, M.A.V. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Methods and routine production of radioisotopes are developed in the Nuclear Engineering Institute, aiming the progressive substitution of import product. A routine production of ^{123} I in 30 mCi/batch is installed. The ^{67} Ga production tests with a capacity for 300 mCi/batch are at end phase. sealed sources of ^{57} Co are also produced for using in gamma cameras calibration. (C.G.C.).

1292 (INIS-BR–3148, pp. 480-482) **[^{99m} Tc ($CNCH_2COO^-$)$_6$]$^{-5}$: preliminary evaluation as tracer for studies of renal function.** Verdera, E.S. (Centro de Investigaciones Nucleares, Montevideo (Uruguay)., Fac. de Ciencias); Lopes L, J.J.; Balter, H.; Leon, E.; Oliver, P.; Tagle, R. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Spanish). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The preliminary results for obtaining [^{99m} Tc ($CNCH_2COO^-$)6]$^{-5}$ are described. This complex is prepared by chemical hydrolysis of resultant molecule from carboethoxi methyl isonitrile labelling with Na ^{99m} Tc O_4 and the yield of these reactions is determined by RP-HPLC. The radiopharmaceutical behaviour in dogs

are made, confirming the attributes of [^{99m} Tc ($CNCH_2$ COO^-)6]^5 as radiodiagnosis for renal function studies. (C.G.C.).

1293 (INIS-BR–3148, pp. 483-484) **Hippuran-^{123} I: labelling and quality control.** Barboza, M.F. de (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Colturato, M.T.; Herrerias, R.; Muramoto, E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The o-iodo hippuric acid labelling with radioiodine is a radiopharmaceutical used with more frequently for evaluation the kidney function. Several reactive kits for labelling with ^{123} I are prepared. Controls of radiochemical purity and biological distribution are made. The reactive kit of hippuran is kept at 4 C during 2 years. (C.G.C.).

1294 (INIS-BR–3148, pp. 488-490) **^{99m} Tc of mercapto-acetyl-glycyl-glycyl-glycine: synthesis, preparation of lyophilization reactive kits and studies of biological distribution.** Almeida, M.A.T.M. de (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Hamada, E.S.; Muramoto, E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The synthesis of ^{99m} Tc mercapto-acetyl-glycyl-glycyl-glycine was made in three steps with satisfactory yields. The studies of biological distribution in mice, showing the relation of radiopharmaceuticals with the kidneys and the suitable urinary excretion was also presented. (C.G.C.).

1295 (INIS-BR–3148, pp. 491-494) **MIBI: preparation and evaluation of lyophilization kits.** Rockmann, T.M.B. (Sao Paulo Univ., SP (Brazil). Faculdade de Medicina); Rezende, M.E.X.; Moraes, D.W.; Braga, G.A.; Muradian, J.; Marques, F.L.N.; Dias Neto, A.L. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The lyophilization kits of MIBI- ^{99m} Tc were obtained by its own synthesis. The quality control showing the high stability of kits was mentioned. the bio-distribution, evaluated in dogs, was identical to that presented by the radiopharmaceutical with the import kit. The obtained results, allowing the prepare of lyophilization kits for medical use were also presented. (C.G.C.).

1296 (INIS-BR–3148, pp. 495-496) **Development of chromatographic technique for quality control of Ga-67 citrate.** Achando, S.S. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Pereira, N.P.S. de. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A chromatographic system for determining of impurities from gallium-67 citrate was developed. This simple method was used for routine experiences. The solvents used in this experience were pyridine, ethanol and water. (C.G.C.).

1297 (INIS-mf–13717) **Synthesis and characterization of fluorine compounds.** Martinez Carrillo, M. Colegio Nacional de Educacion Profesional Tecnica, Lerma (Mexico). 1991. 48p. (In Spanish). Order Number DE94605258. Source: OSTI; NTIS (US Sales Only); INIS.

The (^{18} F) D-glucose, 2-deoxy fluorine (^{18} FDG) is a radio pharmaceutic that is used in nuclear medicine it is utilized mainly in the glucose metabolism. It allows recently to observe the tumors accumulation and growing. The obtention of this radio pharmaceutic can realize by a nucleophilic or electrophilic process through the use of different fluorinated agents obtained as intermediates for introducing the ^{18} F radionuclide in a final step of synthesis. The first methods already has been studied in the National Institute of Nuclear Research. The second one which is based this work and it was realized through the reaction of acetyl hypo fluorite (CH_3COOF) with tri acetyl glucal (TAG) in turn they require the obtention of several fluorated compounds that they serve as intermediates for their obtention so that objective of this work was to find the adequate technique for the obtention of anhydride hydrofluoric acid (HF), KF.2 HF and elemental fluorine so as the design and construction of the systems and equipment used for carry out each one of the reactions. Moreover it was designed the system that will be used for the obtention of acetyl hypo fluoride and the synthesis of composite tetraacetilide 3,4,6 tri-D-glucopyranosil fluoride (TAG-F) for that finally by hydrolysis it was obtained the 2-deoxy fluoride-D-glucose (TAG) in inactive. In this system were realized several preliminary tests. The results are showed in the content of this work also the techniques for compounds characterization were given. (Author).

1298 (INIS-mf–13731, pp. 199) **On the radiocolloidal and pseudoradiocolloidal state of the fissionable element solutions.** Danis, A. (Inst. of Phys. and Nuclear Engineering, Bucharest (Romania)); Ciubotariu, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSIONABLE MATERIALS/solutions; RADIOCOLLOIDS/solutions; SOLUTIONS; PH VALUE; RADIOCOLLOIDS; URANIUM

1299 (INIS-mf–13731, pp. 272) **Dissociation of ^{11}Li with 34 MeV/n.** Tretyakova, S.P. (LNR, JINR, Dubna (Russian Federation)); Golovchenko, A.; Tretyakova, T.; Borcea, C.; Lewitowicz, M.; Toustain, C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LITHIUM 11/dissociation; LITHIUM 11/mev range 100-1000; DIELECTRIC TRACK DETECTORS; ENERGY LOSSES; DISSOCIATION; LITHIUM 9; PARTICLE TRACKS

1300 (JINR-R–6-92-397) **Preparation of small size radioactive sources by means of the Langmuir - Blodgett method.** Vons, B.; Novgorodov, A.F.; Kovalik, A.; Belikov, K.A.; Lebedev, N.A.; Mikulski, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 14p. (In Russian). Order Number DE94605260. Source: OSTI; NTIS (US Sales Only); INIS.

A modified Langmuir - Blodgett technique for a preparation of small size radioactive sources is described. The method is based on a chemi-sorption of ultra-micro amounts of radioactive nuclides from a drop of water solution of ultra-micro amounts of radioactive nuclides from a drop of water solution onto a backing covered by a monolayer of stearin acid. A chemical yield of as much as 90% can be achieved. Preparared radioactive sources for low energy electron spectroscopy exhibited very high quality. 16 refs.; 8 figs.

1301 (LA-UR–93-3464) **Atomic thermal vibrations of the light actinide elements.** Lawson, A.C.; Goldstone, J.A.; Cort, B.; Sheldon, R.I.; Foltyn, E.M. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ;W-31109-ENG-38. (CONF-930905–8: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000684. Source: OSTI; NTIS; INIS; GPO Dep.

We have been using time-of-flight neutron powder diffraction to determine the Debye-Waller factors of the light actinide elements. The Debye-Waller factor is a measure of the mean-square atomic displacement that arises from the thermal motion of the atoms in any solid. Its temperature dependence determines a Debye-Waller temperature, Θ_{DW}, that is characteristic of the elastic properties of the solid. The data are obtained by Rietveld analysis of neutron diffraction powder patterns obtained at several temperatures. We have analyzed the results for α-U, α-Np, α-Pu and γ-$Pu_{0.95}Al_{0.05}$. The measured temperature dependence of the Θ_{DW}'s can be interpreted with an "effective" Groneisen constant, whose numerical values are much too high to be explained with harmonic forces.

1302 (LBL–34661) **Preparation and synthetic utility of MCl_4 ($Me_2NCH_2CH_2NMe_2$)$_2$ where M is uranium or thorium.** Edwards, P.G. (California Univ., Berkeley, CA (United States). Dept. of Chemistry); Weydert, M.; Petrie, M.A.; Andersen, R.A. Lawrence Berkeley Lab., CA (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94002273. Source: OSTI; NTIS; GPO Dep.

Uranium tetrachloride or thorium tetrachloride dissolve in a solution of $Me_2NCH_2CH_2NMe_2$ (tmed) in toluene to give green UCl_4(tmed)$_x$ or UI_4(tmed)$_x$, where X lies between 1 and 2. The tmed complexes are useful synthons for other ligand complexes as well as for $(MeC_5H_4)_4Th$.

1303 (PSI-PROC–92-01) **Targetry '91: Proceedings of the 4. international workshop on targetry and target chemistry.** Paul Scherrer Inst. (PSI), Villigen (Switzerland). 1992. 286p. (CONF-9109109–: 4. international workshop on targetry and target chemistry, Villigen (Switzerland), 9-12 Sep 1991). Order Number DE93612045. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

1304 (WINCO–11973) **Column chromatographic separation of Y^{3+} from Sr^{2+} by polymeric ionizable crown ether resins.** Wood, D.J. (Idaho Univ., Moscow, ID (United States). Dept. of Chemistry); Elshani, S.; Wai, C.M.; Bartsch, R.A.; Huntley, M.; Hartenstein,. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94000935. Source: OSTI; NTIS; GPO Dep.

Condensation polmers containing subunits of crown ether carboxylic acid monomers are effective stationary phases for the chromatographic separation of Y^{3+} and Sr^{2+}. The pH range and metal loading capacities for the resins have been determined under equilibrium conditions. The resin can be regenerated for repeated use without losing its separation capability. Altering the molecular structure of the monomer (sym-dibenzo-16-crown-5-oxyacetic acid) by an alkyl substitution on the macrocyclic cavity decreases the loading capacity of the resin.

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Refer also to citation(s) 43, 1150, 1151, 1152, 1153, 1227, 1228, 1232, 1235, 1236, 1237, 1238, 1239, 1240, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1842, 1850, 1851, 1856, 1857, 2537, 2548, 2549, 2828

1305 (AAA-KTF/FKF–92/3) **Some comparisons of model predictions to experimental data on gas-phase reactions of NH_3 and HCN.** Kilpinen, P. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 11p. Order Number DE94709698. Source: OSTI; NTIS.

This report shows some comparisons of model predictions to experimental data on gas-phase reactions of NH_3 and HCN. The experimental data deals with the oxidation of NH_3 and HCN by excess O_2, and the reduction of NO by NH_3 ('Thermal DeNO_x') with and without the presence of additives (H_2, CO, CH_4). The data has been obtained in a laboratory isothermal plug flow reactor of quartz. The temperature range studied has been 700-1100 deg C. The pressure has been one atmosphere. The model uses kinetics of elementary reactions. The mechanism comprises in total 253 reactions between 49 chemical species consisting of the elements C, H, O, and/or N. This report concentrates to show only the results of the comparisons. Any attempts to identify the inadequacies in the mechanism or to improve the mechanism have not been made. All the calculations were made assuming an ideal isothermal plug flow condition.

1306 (BNL–48923, pp. 12-15) **Turbulence-chemistry interactions in reacting flows.** Barlow, R.S. (Sandia National Laboratories, Livermore, CA (United States)); Carter, C.D. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Interactions between turbulence and chemistry in nonpremixed flames are investigated through multiscalar measurements. Simultaneous point measurements of major species, NO, OH, temperature, and mixture fraction are obtained by combining spontaneous Raman scattering, Rayleigh scattering, and laser-induced fluorescence (LIF). NO and OH fluorescence signals are converted to quantitative concentrations by applying shot-to-shot corrections for local variations of the Boltzmann fraction and collisional quenching rate. These measurements of instantaneous thermochemical states in turbulent flames provide insights into the fundamental nature of turbulence-chemistry interactions. The measurements also constitute a unique data base for evaluation and refinement of turbulent combustion models. Experimental work during the past year has focused on three areas: (1) investigation of the effects of differential molecular diffusion in turbulent combustion: (2) experiments on the effects of Halon CF_3Br, a fire retardant, on the structure of turbulent flames of CH_4 and $CO/H_2/N_2$; and (3) experiments on NO formation in turbulent hydrogen jet flames.

1307 (BNL–48923, pp. 24-27) **Energy partitioning in elementary chemical processes.** Bersohn, R. (Columbia Univ., New York, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

In the past year research has centered on the decomposition of hot molecules, the reaction of ethynyl radicals with hydrogen molecules and the reaction of oxygen atoms with acetylene. Reaction kinetics studies are reported for each of these systems.

1308 (BNL–48923, pp. 28-31) **Theoretical studies of combustion dynamics.** Bowman, J.M. (Emory Univ., Atlanta, GA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The basic objectives of this research program are to develop and apply theoretical techniques to fundamental dynamical processes of importance in gas-phase combustion. There are two major areas currently supported by this grant. One is reactive scattering of diatom-diatom systems, and the other is the dynamics of complex formation and decay based on L^2 methods. In all of these studies, the authors focus on systems that are of interest experimentally, and for which potential energy surfaces based, at least in part, on ab initio calculations are available.

1309 (BNL–48923, pp. 32-34) **Combustion chemistry.** Brown, N.J. (Lawrence Berkeley Laboratory, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This research is concerned with the development and use of sensitivity analysis tools to probe the response of dependent variables to model input variables. Sensitivity analysis is important at all levels of combustion modeling. This group's research continues to be focused on elucidating the interrelationship between features in the underlying potential energy surface (obtained from ab initio quantum chemistry calculations) and their responses in the quantum dynamics, e.g., reactive transition probabilities, cross sections, and thermal rate coefficients. The goals of this research are: (i) to provide feedback information to quantum chemists in their potential surface refinement efforts, and (ii) to gain a better understanding of how various regions in the potential influence the dynamics. These investigations are carried out with the methodology of quantum functional sensitivity analysis (QFSA).

1310 (BNL–48923, pp. 35-38) **Bond selective chemistry beyond the adiabatic approximation.** Butler, L.J. (Univ. of Chicago, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

One of the most important challenges in chemistry is to develop predictive ability for the branching between energetically allowed chemical reaction pathways. Such predictive capability, coupled with a fundamental understanding of the important molecular interactions, is essential to the development and utilization of new fuels and the design of efficient combustion processes. Existing transition state and exact quantum theories successfully predict the branching between available product channels for systems in which each reaction coordinate can be adequately described by different paths along a single adiabatic potential energy surface. In particular, unimolecular dissociation following thermal, infrared multiphoton, or overtone excitation in the ground state yields a branching between energetically allowed product channels which can be successfully predicted by the application of statistical theories, i.e. the weakest bond breaks. (The predictions are particularly good for competing reactions in which when there is no saddle point along the reaction coordinates, as in simple bond fission reactions.) The predicted lack of bond selectivity results from the assumption of rapid internal vibrational energy redistribution and the implicit use of a single adiabatic Born-Oppenheimer potential energy surface for the reaction. However, the adiabatic approximation is not valid for the reaction of a wide variety of energetic materials and organic fuels; coupling between the electronic states of the reacting species play a a key role in determining the selectivity of the chemical reactions induced. The work described below investigated the central role played by coupling between electronic states in polyatomic molecules in determining the selective branching between energetically allowed fragmentation pathways in two key systems.

1311 (BNL–48923, pp. 43-46) **Direct numerical simulation of turbulent reacting flows.** Chen, J.H. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The development of turbulent combustion models that reflect some of the most important characteristics of turbulent reacting flows requires knowledge about the behavior of key quantities in well defined combustion regimes. In turbulent flames, the coupling between the turbulence and the chemistry is so strong in certain regimes that is is very difficult to isolate the role played by one individual phenomenon. Direct numerical simulation (DNS) is an extremely useful tool to study in detail the turbulence-chemistry interactions in certain well defined regimes. Globally, non-premixed flames are controlled by two limiting cases: the fast chemistry limit, where the turbulent fluctuations. In between these two limits, finite-rate chemical effects are important and the turbulence interacts strongly with the chemical processes. This regime is important because industrial burners operate in regimes in which, locally the flame undergoes extinction, or is at least in some nonequilibrium condition. Furthermore, these nonequilibrium conditions strongly influence the production of pollutants. To quantify the finite-rate chemistry effect, direct numerical simulations are performed to study the interaction between an initially laminar non-premixed flame and a three-dimensional field of homogeneous isotropic decaying turbulence. Emphasis is placed on the dynamics of extinction and on transient effects on the fine scale mixing process. Differential molecular diffusion among species is also examined with this approach, both for nonreacting and reacting situations. To address the problem of large-scale mixing and to examine the effects of mean shear, efforts are underway to perform large eddy simulations of round three-dimensional jets.

1312 (BNL–48923, pp. 52-55) **A shock tube study of the reactions of the hydroxyl radical with combustion species.** Cohen, N. (The Aerospace Corporation, Los Angeles, CA (United States)); Koffend, J.B. Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract FG03-87ER13812. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

To extend the semi-empirical techniques of Benson and coworkers, and to extend the database of reliable high temperature measurements of OH radicals with hydrocarbons and other fuels and their decomposition products, the authors undertook a research program with both experimental and computational tasks. The experimental goal was to design a procedure for measuring, at combustion temperatures, the reaction rate coefficients of OH radicals with fuels and other species of importance in combustion or propulsion systems. The computational effort was intended to refine the semi-empirical transition-state-theory procedures for extrapolating rate coefficients of reactions of OH with combustion species of interest, for predicting rate coefficients for species not studied in the laboratory, and to examine the ability of the theory to predict rate coefficients for different pathways in the case the reagent possessed more than one nonequivalent H atoms.

1313 (BNL–48923, pp. 56-57) **Resonance ionization detection of combustion radicals.** Cool, T.A. (Cornell Univ., Ithaca, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Fundamental research on the combustion of halogenated organic compounds with emphasis on reaction pathways leading to the formation of chlorinated aromatic compounds and the development of continuous emission monitoring methods will assist in DOE efforts in the management and disposal of hazardous chemical wastes. Selective laser ionization techniques are used in this laboratory for the measurement of concentration profiles of radical intermediates in the combustion of chlorinated hydrocarbon flames. A new ultrasensitive detection technique, made possible with the advent of tunable VUV laser sources, enables the selective near-threshold photoionization of all radical intermediates in premixed hydrocarbon and chlorinated hydrocarbon flames.

1314 (BNL–48923, pp. 62-65) **Infrared absorption spectroscopy and chemical kinetics of free radicals.** Curl, R.F. (Rice

Univ., Houston, TX (United States)); Glass, G.P. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This research is directed at the detection, monitoring, and study of chemical kinetic behavior by infrared absorption spectroscopy of small free radical species thought to be important intermediates in combustion. During the last year, infrared kinetic spectroscopy using excimer laser flash photolysis and color-center laser probing has been employed to study the high resolution spectrum of HCCN, the rate constant of the reaction between ethynyl (C_2H) radical and H_2 in the temperature region between 295 and 875 K, and the recombination rate of propargyl (CH_2CCH) at room temperature.

1315 (BNL–48923, pp. 66-69) **Spectroscopy and reactions of vibrationally excited transient molecules.** Dai, H.L. (Univ. of Pennsylvania, Philadelphia (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Spectroscopy, energy transfer and reactions of vibrationally excited transient molecules are studied through a combination of laser-based excitation techniques and efficient detection of emission from the energized molecules with frequency and time resolution. Specifically, a Time-resolved Fourier Transform Emission Spectroscopy technique has been developed for detecting dispersed laser-induced fluorescence in the IR, visible and UV regions. The structure and spectroscopy of the excited vibrational levels in the electronic ground state, as well as energy relaxation and reactions induced by specific vibronic excitations of a transient molecule can be characterized from time-resolved dispersed fluorescence in the visible and UV region. IR emissions from highly vibrational excited levels, on the other hand, reveal the pathways and rates of collision induced vibrational energy transfer.

1316 (BNL–48923, pp. 74-77) **Comprehensive mechanisms for combustion chemistry: Experiment, modeling, and sensitivity analysis.** Dryer, F.L. (Princeton Univ., NJ (United States)); Yetter, R.A. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This research program is an integrated experimental/numerical effort to study pyrolysis and oxidation reactions and mechanisms for small-molecule hydrocarbon structures under conditions representative of combustion environments. The experimental aspects of the work are conducted in large diameter flow reactors, at pressures from one to twenty atmospheres, temperatures from 550 K to 1200 K, and with observed reaction times from 10^{-2} to 5 seconds. Gas sampling of stable reactant, intermediate, and product species concentrations provides not only substantial definition of the phenomenology of reaction mechanisms, but a significantly constrained set of kinetic information with negligible diffusive coupling. Analytical techniques used for detecting hydrocarbons and carbon oxides include gas chromatography (GC), and gas infrared (NDIR) and FTIR methods are utilized for continuous on-line sample detection of light absorption measurements of OH have also been performed in an atmospheric pressure flow reactor (APFR), and a variable pressure flow (VPFR) reactor is presently being instrumented to perform optical measurements of radicals and highly reactive molecular intermediates. The numerical aspects of the work utilize zero and one-dimensional pre-mixed, detailed kinetic studies, including path, elemental gradient sensitivity, and feature sensitivity analyses. The program emphasizes the use of hierarchical mechanistic construction to understand and develop detailed kinetic mechanisms. Numerical studies are utilized for guiding experimental parameter selections, for interpreting observations, for extending the predictive range of mechanism constructs, and to study the effects of diffusive transport coupling on reaction behavior in flames. Modeling using well defined and validated mechanisms for the CO/H_2/oxidant systems.

1317 (BNL–48923, pp. 78-80) **Kinetic studies of elementary chemical reactions.** Durant, J.L. Jr. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This program concerning kinetic studies of elementary chemical reactions is presently focussed on understanding reactions of NH_x species. To reach this goal, the author is pursuing experimental studies of reaction rate coefficients and product branching fractions as well as using electronic structure calculations to calculate transition state properties and reaction rate calculations to relate these properties to predicted kinetic behavior. The synergy existing between the experimental and theoretical studies allow one to gain a deeper insight into more complex elementary reactions.

1318 (BNL–48923, pp. 86-89) **Low energy ion-molecule reactions.** Farrar, J.M. (Univ. of Rochester, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This project is concerned with elucidating the dynamics of elementary ion-molecule reactions at collision energies near and below 1 eV. From measurements of the angular and energy distributions of the reaction products, one can infer intimathe details about the nature of collisions leading to chemical reaction, the geometries and lifetimes of intermediate complexes that govern the reaction dynamics, and the collision energy dependence of these dynamical features. The author employs crossed-beam low energy mass spectrometry technology developed over the last several years, with the focus of current research on proton transfer and hydrogen atom transfer reactions of te O^- ion with species such as HF, H_2O, and NH_3.

1319 (BNL–48923, pp. 90-93) **Quantitative degenerate four-wave mixing spectroscopy: Probes for molecular species.** Farrow, R. (Sandia National Laboratories, Livermore, CA (United States)); Rakestraw, D.; Paul, P.; Lucht, R.; Danehy, P.; Friedman-Hill, E.; Germann, G. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Resonant degenerate four-wave mixing (DFWM) is currently the subject of intensive investigation as a sensitive diagnostic tool for molecular species. DFWM has the advantage of generating a coherent (beam-like) signal which results in null-background detection and provides excellent immunity to background-light interference. Since multiple one-photon resonances are involved in the signal generation process, the DFWM technique can allow sensitive detection of molecules via electronic, vibrational or rotational transitions. These properties combine to make DFWM a widely applicable diagnostic technique for the probing of molecular species. The authors are conducting fundamental and applied investigations of DFWM for quantitative measurements of trace species in reacting gases. During the past year, efforts have been focussed in two areas: (1) understanding the effects of collisional processes on the DFWM signal generation process, and (2) exploring the applicability of infrared DFWM to detect polyatomic molecules via rovibrational transitions.

1320 (BNL–48923, pp. 106-109) **HTP kinetics studies on isolated elementary combustion reactions over wide temperature ranges.** Fontijn, A. (Rensselaer Polytechnic Institute, Troy, NY (United States)); Adusei, G.Y.; Hranisavlevic, J.; Bajaj, P.N. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goals of this project are to provide accurate data on the temperature dependence of the kinetics of elementary combustion reactions, (i) for use by combustion modelers, and (ii) to gain a

better fundamental understanding of, and hence predictive ability for, the chemistry involved. Experimental measurements are made mainly by using the pseudo-static HTP (high-temperature photochemistry) technique. While continuing rate coefficient measurements, further aspects of kinetics research are being explored. Thus, starting from the data obtained, a method for predicting the temperature dependence of rate coefficients of oxygen-atom olefin experiment and confirms the underlying mechanistic assumptions. Mechanistic information of another sort, i.e. by product analysis, has recently become accessible with the inauguration of our heated flow tube mass spectrometer facility; early results are reported here. HTP experiments designed to lead to measurements of product channels by resonance fluorescence have started.

1321 (BNL–48923, pp. 114-116) **Aromatic-radical oxidation chemistry.** Glassman, I. (Princeton Univ., NJ (United States)); Brezinsky, K. Brookhaven National Lab., Upton, NY (United States). 1993. DOE Contract FG02-86ER13554. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The research effort has focussed on discovering an explanation for the anomalously high CO_2 concentrations observed early in the reaction sequence of the oxidation of cyclopentadiene. To explain this observation, a number of plausible mechanisms have been developed which now await experimental verification. One experimental technique for verifying mechanisms is to probe the reacting system by perturbing the radical concentrations. Two forms of chemical perturbation of the oxidation of cyclopentadiene were begun during this past year–the addition of NO_2 and CO to the reacting mixture.

1322 (BNL–48923, pp. 117-120) **Fundamental spectroscopic studies of carbenes and hydrocarbon radicals.** Gottlieb, C.A. (Harvard Univ., Cambridge, MA (United States)); Thaddeus, P. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Highly reactive carbenes and carbon-chain radicals are studied at millimeter wavelengths by observing their rotational spectra. The purpose is to provide definitive spectroscopic identification, accurate spectroscopic constants in the lowest vibrational states, and reliable structures of the key intermediates in reactions leading to aromatic hydrocarbons and soot particles in combustion.

1323 (BNL–48923, pp. 125-126) **Chemical dynamics in the gas phase: Time-dependent quantum mechanics of chemical reactions.** Gray, S.K. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

A major goal of this research is to obtain an understanding of the molecular reaction dynamics of three and four atom chemical reactions using numerically accurate quantum dynamics. This work involves: (i) the development and/or improvement of accurate quantum mechanical methods for the calculation and analysis of the properties of chemical reactions (e.g., rate constants and product distributions), and (ii) the determination of accurate dynamical results for selected chemical systems, which allow one to compare directly with experiment, determine the reliability of the underlying potential energy surfaces, and test the validity of approximate theories. This research emphasizes the use of recently developed time-dependent quantum mechanical methods, i.e. wave packet methods.

1324 (BNL–48923, pp. 131-134) **Studies of combustion kinetics and mechanisms.** Gutman, D. (Catholic Univ. of America, Washington, DC (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The objective of the current research is to gain new quantitative knowledge of the kinetics and mechanisms of polyatomic free radicals which are important in hydrocarbon combustion processes. The special facility designed and built for these (which includes a heatable tubular reactor coupled to a photoionization mass spectrometer) is continually being improved. Where possible, these experimental studies are coupled with theoretical ones, sometimes conducted in collaboration with others, to obtain an improved understanding of the factors determining reactivity. The decomposition of acetyl radicals, isopropyl radicals, and n-propyl radicals have been studied as well as the oxidation of methylpropargyl radicals.

1325 (BNL–48923, pp. 138-141) **Spectroscopy and kinetics of combustion gases at high temperatures.** Hanson, R.K. (Stanford Univ., CA (United States)); Bowman, C.T. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This program involves two complementary activities: (1) development and application of cw ring dye laser absorption methods for sensitive detection of radical species and measurement of fundamental spectroscopic parameters at high temperatures; and (2) shock tube studies of reaction kinetics relevant to combustion. Species currently under investigation in the spectroscopic portion of the research include NO and CH_3; this has necessitated the continued operated at wavelengths in the range 210-230 nm. Shock tube studies of reaction kinetics currently are focussed on reactions involving CH_3 radicals.

1326 (BNL–48923, pp. 142-144) **Theoretical studies of potential energy surfaces.** Harding, L.B. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The goal of this program is to calculate accurate potential energy surfaces (PES) for both reactive and nonreactive systems. To do this the electronic Schrodinger equation must be solved. Our approach to this problem starts with multiconfiguration self-consistent field (MCSCF) reference wavefunctions. These reference wavefunctions are designed to be sufficiently flexible to accurately describe changes in electronic structure over a broad range of geometries. Electron correlation effects are included via multireference, singles and doubles configuration interaction (MRSDCI) calculations. With this approach, the authors are able to provide useful predictions of the energetics for a broad range of systems.

1327 (BNL–48923, pp. 149-156) **Elementary reaction rate measurements at high temperatures by tunable-laser flash-absorption.** Hessler, J.P. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The major objective of this program is to measure thermal rate coefficients and branching ratios of elementary reactions. To perform these measurements, the authors constructed an ultrahigh-purity shock tube to generate temperatures between 1000 and 5500 K. The tunable-laser flash-absorption technique is used to measure the rate of change of the concentration of species which absorb below 50,000 cm^{-1} e.g.: OH, CH, and CH_3. This technique is being extended into the vacuum-ultraviolet spectral region where one can measure atomic species e.g.: H, D, C, O, and N; and diatomic species e.g.: O_2, CO, and OH.

1328 (BNL–48923, pp. 157-159) **Studies of combustion reactions at the state-resolved differential cross section level.** Houston, P.L. (Cornell Univ., Ithaca, NY (United States)); Suits, A.G.; Bontuyan, L.S.; Whitaker, B.J. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion

research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

State-resolved differential reaction cross sections provide perhaps the most detailed information about the mechanism of a chemical reaction, but heretofore they have been extremely difficult to measure. This program explores a new technique for obtaining differential cross sections with product state resolution. The three-dimensional velocity distribution of state-selected reaction products is determined by ionizing the appropriate product, waiting for a delay while it recoils along the trajectory imparted by the reaction, and finally projecting the spatial distribution of ions onto a two dimensional screen using a pulsed electric field. Knowledge of the arrival time allows the ion position to be converted to a velocity, and the density of velocity projections can be inverted mathematically to provide the three-dimensional velocity distribution for the selected product. The main apparatus has been constructed and tested using photodissociations. The authors report here the first test results using crossed beams to investigate collisions between Ar and NO. Future research will both develop further the new technique and employ it to investigate methyl radical, formyl radical, and hydrogen atom reactions which are important in combustion processes. The authors intend specifically to characterize the reactions of CH_3 with H_2 and H_2CO; of HCO with O_2; and of H with CH_4, CO_2, and O_2.

1329 (BNL–48923, pp. 160-163) **Aromatics oxidation and soot formation in flames.** Howard, J.B. (Massachusetts Institute of Technology, Cambridge (United States)); Pope, C.J.; Shandross, R.A.; Yadav, T. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This project is concerned with the kinetics and mechanisms of aromatics oxidation and soot and fullerenes formation in flames. The scope includes detailed measurements of profiles of stable and radical species concentrations in low-pressure one-dimensional premixed flames. Intermediate species identifications and mole fractions, fluxes, and net reaction rates calculated from the measured profiles are used to test postulated reaction mechanisms. Particular objectives are to identify and to determine or confirm rate constants for the main benzene oxidation reactions in flames, and to characterize fullerenes and their formation mechanisms and kinetics.

1330 (BNL–48923, pp. 164-166) **Ionization probes of molecular structure and chemistry.** Johnson, P.M. (State Univ. of New York, Stony Brook (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Various photoionization processes provide very sensitive probes for the detection and understanding of the spectra of molecules relevant to combustion processes. The detection of ionization can be selective by using resonant multiphoton ionization or by exploiting the fact that different molecules have different sets of ionization potentials. Therefore, the structure and dynamics of individual molecules can be studied even in a mixed sample. The authors are continuing to develop methods for the selective spectroscopic detection of molecules by ionization, and to use these methods for the study of some molecules of combustion interest.

1331 (BNL–48923, pp. 173-176) **Toluene pyrolysis studies and high temperature reactions of propargyl chloride.** Kern, R.D. (Univ. of New Orleans, LA (United States)); Chen, H.; Qin, Z. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The main focus of this program is to investigate the thermal decompositions of fuels that play an important role in the pre-particle soot formation process. It has been demonstrated that the condition of maximum soot yield is established when the reaction conditions of temperature and pressure are sufficient to establish a radical pool to support the production of polyaromatic hydrocarbon species and the subsequent formation of soot particles. However, elevated temperatures result in lower soot yields which are attributed to thermolyses of aromatic ring structures and result in the bell-shaped dependence of soot yield on temperature. The authors have selected several acyclic hydrocarbons to evaluate the chemical thermodynamic and kinetic effects attendant to benzene formation. To assess the thermal stability of the aromatic ring, the authors have studied the pyrolyses of benzene, toluene, ethylbenzene, chlorobenzene and pyridine. Time-of-flight mass spectrometry (TOF) is employed to analyze the reaction zone behind reflected shock waves. Reaction time histories of the reactants, products, and intermediates are constructed and mechanisms are formulated to model the experimental data. The TOF work is often performed with use of laser schlieren densitometry (LS) to measure density gradients resulting from the heats of various reactions involved in a particular pyrolytic system. The two techniques, TOF and LS, provide independent and complementary information about ring formation and ring rupture reactions.

1332 (BNL–48923, pp. 177-180) **Stochastic models for turbulent reacting flows.** Kerstein, A. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is to develop and apply stochastic models of various processes occurring within turbulent reacting flows in order to identify the fundamental mechanisms governing these flows, to support experimental studies of these flows, and to further the development of comprehensive turbulent reacting flow models.

1333 (BNL–48923, pp. 181-184) **Kinetics of combustion related processes at high temperatures.** Kiefer, J.H. (Univ. of Illinois, Chicago (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This past year has seen an excursion into perhalomethane dissociation using the laser-schlieren (LS) technique, with work on CCl_4 already published and on CF_3Cl under analysis. However, the author's emphasis has again been on the study of relaxation and dissociation of large molecules using the converging/diverging nozzle method to generate very weak (low pressure) shock waves.

1334 (BNL–48923, pp. 185-188) **Combustion kinetics and reaction pathways.** Klemm, R.B. (Brookhaven National Laboratory, Upton, NY (United States)); Sutherland, J.W. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This project is focused on the fundamental chemistry of combustion. The overall objectives are to determine rate constants for elementary reactions and to elucidate the pathways of multichannel reactions. A multitechnique approach that features three independent experiments provides unique capabilities in performing reliable kinetic measurements over an exceptionally wide range in temperature, 300 to 2500 K. Recent kinetic work has focused on experimental studies and theoretical calculations of the methane dissociation system ($CH_4 + Ar \rightarrow CH_3 + H + Ar$ and $H + CH_4 \rightarrow CH_3 + H_2$). Additionally, a discharge flow-photoionization mass spectrometer (DF-PIMS) experiment is used to determine branching fractions for multichannel reactions and to measure ionization thresholds of free radicals. Thus, these photoionization experiments generate data that are relevant to both reaction pathways studies (reaction dynamics) and fundamental thermochemical research. Two distinct advantages of performing PIMS with high intensity, tunable vacuum ultraviolet light at the National Synchrotron Light Source are high detection sensitivity and exceptional selectivity in monitoring radical species.

1335 (BNL–48923, pp. 189-191) **Studies in combustion dynamics.** Koszykowski, M.L. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is to develop a fundamental understanding and a quantitative predictive capability in combustion modeling. A large part of the understanding of the chemistry of combustion processes comes from "chemical kinetic modeling." However, successful modeling is not an isolated activity. It necessarily involves the integration of methods and results from several diverse disciplines and activities including theoretical chemistry, elementary reaction kinetics, fluid mechanics and computational science. Recently the authors have developed and utilized new tools for parallel processing to implement the first numerical model of a turbulent diffusion flame including a "full" chemical mechanism.

1336 (BNL–48923, pp. 195-198) **Dynamics and structure of stretched flames.** Law, C.K. (Princeton Univ., NJ (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This program aims to gain fundamental understanding on the structure, geometry, and dynamics of laminar premixed flames, and relate these understanding to the practical issues of flame extinction and stabilization. The underlying fundamental interest here is the recent recognition that the response of premixed flames can be profoundly affected by flame stretch, as manifested by flow nonuniformity, flame curvature, and flame/flow unsteadiness. As such, many of the existing understanding on the behavior of premixed flames need to be qualitatively revised. The research program consists of three major thrusts: (1) detailed experimental and computational mapping of the structure of aerodynamically-strained planar flames, with emphasis on the effects of heat loss, nonequidiffusion, and finite residence time on the flame thickness, extent of incomplete reaction, and the state of extinction. (2) Analytical study of the geometry and dynamics of stretch-affected wrinkled flame sheets in simple configurations, as exemplified by the Bunsen flame and the spatially-periodic flame, with emphasis on the effects of nonlinear stretch, the phenomena of flame cusping, smoothing, and tip opening, and their implications on the structure and burning rate of turbulent flames. (3) Stabilization and blowoff of two-dimensional inverted premixed and stabilization and determining the criteria governing flame blowoff. The research is synergistically conducted through the use of laser-based diagnostics, computational simulation of the flame structure with detailed chemistry and transport, and mathematical analysis of the flame dynamics.

1337 (BNL–48923, pp. 199-204) **Molecular beam studies of reaction dynamics.** Lee, Y.T. (Lawrence Berkeley Laboratory, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The major thrust of this research project is to elucidate detailed dynamics of simple elementary reactions that are theoretically important and to unravel the mechanism of complex chemical reactions or photochemical processes that play important roles in many macroscopic processes. Molecular beams of reactants are used to study individual reactive encounters between molecules or to monitor photodissociation events in a collision-free environment. Most of the information is derived from measurement of the product fragment energy, angular, and state distributions. Recent activities are centered on the mechanisms of elementary chemical reactions involving oxygen atoms with unsaturated hydrocarbons, the dynamics of endothermic substitution reactions, the dependence of the chemical reactivity of electronically excited atoms on the alignment of excited orbitals, the primary photochemical processes of polyatomic molecules, intramolecular energy transfer of chemically activated and locally excited molecules, the energetics of free radicals that are important to combustion processes, the infrared-absorption spectra of carbonium ions and hydrated hydronium ions, and bond-selective photodissociation through electric excitation.

1338 (BNL–48923, pp. 205-208) **Time-resolved FTIR emission studies of laser photofragmentation and radical reactions.** Leone, S.R. (Univ. of Colorado, Boulder (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Recent studies have focused specifically on collision processes, such as single collision energy transfer, reaction dynamics, and radical reactions. The authors employ novel FTIR techniques in the study of single collision energy transfer processes using translationally fast H atom, as well as radical-radical reactions, e.g. CH_3 + O, CF_3 + H(D), and Cl + C_2H_5. The fast atoms permit unique high energy regions of certain transition states of combustion species to be probed for the first time.

1339 (BNL–48923, pp. 209-212) **Spectroscopy and reaction dynamics of collision complexes containing hydroxyl radicals.** Lester, M.I. (Univ. of Pennsylvania, Philadelphia (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The DOE supported work in this laboratory has focused on the spectroscopic characterization of the interaction potential between an argon atom and a hydroxyl radical in the ground $X^2\Pi$ and excited $A\ ^2\Sigma^+$ electronic states. The OH-Ar system has proven to be a test case for examining the interaction potential in an open-shell system since it is amenable to experimental investigation and theoretically tractable from first principles. Experimental identification of the bound states supported by the Ar + OH ($X\ ^2\Pi$) and Ar + OH($A\ ^2\Sigma^+$) potentials makes it feasible to derive realistic potential energy surfaces for these systems. The experimentally derived intermolecular potentials provide a rigorous test of ab initio theory and a basis for understanding the dramatically different collision dynamics taking place on the ground and excited electronic state surfaces.

1340 (BNL–48923, pp. 221-224) **Kinetics and mechanisms of reactions involving small aromatic reactive intermediates.** Lin, M.C. (Emory Univ., Atlanta, GA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Small aromatic radicals such as C_6H_5, C_6H_5O and C_6H_4 are key prototype species of their homologs. C_6H_5 and its oxidation product, C_6H_5O are believed to be important intermediates which play a pivotal role in hydrocarbon combustion, particularly with regard to soot formation. Despite their fundamental importance, experimental data on the reaction mechanisms and reactivities of these species are very limited. For C_6H_5, most kinetic data except its reactions with NO and NO_2, were obtained by relative rate measurements. For C_6H_5O, the authors have earlier measured its fragmentation reaction producing C_5H_5 + CO in shock waves. For C_6H_4, the only rate constant measured in the gas phase is its recombination rate at room temperature. The authors have proposed to investigate systematically the kinetics and mechanisms of this important class of molecules using two parallel laser diagnostic techniques–laser resonance absorption (LRA) and resonance enhanced multiphoton ionization mass spectrometry (REMPI/MS). In the past two years, study has been focused on the development of a new multipass adsorption technique–the "cavity-ring-down" technique for kinetic applications. The preliminary results of this study appear to be quite good and the sensitivity of the technique is at least comparable to that of the laser-induced fluorescence method.

1341 (BNL–48923, pp. 225-226) **Crossed-beam studies of the dynamics of radical reactions.** Liu, K. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton,

NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The objective of this program is to characterize the detailed dynamics of elementary radical reactions and to provide a better understanding of radical reactivity in general. The radical beam is typically generated by a laser photolysis method. After colliding with the reacting molecule in a crossed-beam apparatus, the reaction product state distribution is interrogated by laser spectroscopic techniques. Several radicals of combustion significance, such as O, CH, OH, CN and NCO have been successfully generated and their collisional behavior at the state-to-state integral cross section level of detail has been studied in this manner. During the past year, the detection system has been converted from LIF to REMPI schemes, and the emphasis of this program shifted to investigate the product angular distributions. Both inelastic and reactive processes have been studied.

1342 (BNL–48923, pp. 227-228) **Transverse flow reactor studies of the dynamics of radical reactions.** Macdonald, R.G. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Radical reactions are in important in combustion chemistry; however, little state-specific information is available for these reactions. A new apparatus has been constructed to measure the dynamics of radical reactions. The unique feature of this apparatus is a transverse flow reactor in which an atom or radical of known concentration will be produced by pulsed laser photolysis of an appropriate precursor molecule. The time dependence of individual quantum states or products and/or reactants will be followed by rapid infrared laser absorption spectroscopy. The reaction $H + O_2 \rightarrow OH + O$ will be studied.

1343 (BNL–48923, pp. 232-234) **Chemical kinetics and combustion modeling.** Miller, J.A. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is to gain qualitative insight into how pollutants are formed in combustion systems and to develop quantitative mathematical models to predict their formation rates. The approach is an integrated one, combining low-pressure flame experiments, chemical kinetics modeling, theory, and kinetics experiments to gain as clear a picture as possible of the process in question. These efforts are focused on problems involved with the nitrogen chemistry of combustion systems and on the formation of soot and PAH in flames.

1344 (BNL–48923, pp. 235-238) **Reaction dynamics in polyatomic molecular systems.** Miller, W.H. (Lawrence Berkeley Laboratory, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is the development of theoretical methods and models for describing the dynamics of chemical reactions, with specific interest for application to polyatomic molecular systems of special interest and relevance. There is interest in developing the most rigorous possible theoretical approaches and also in more approximate treatments that are more readily applicable to complex systems.

1345 (BNL–48923, pp. 248-249) **Fast beam studies of free radical photodissociation.** Neumark, D.M. (Lawrence Berkeley Laboratory, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The authors have developed a novel technique for studying the photodissociation spectroscopy and dynamics of free radicals. In these experiments, radicals are generated by laser photodetachment of a fast (6-8 keV) mass-selected negative ion beam. The resulting radicals are photodissociated with a second laser, and the photofragments are collected and detected with high efficiency using a microchannel plate detector. The overall process is: $ABC^- \rightarrow ABC + e^- \rightarrow A + BC$, $AB + C$. Two types of fragment detection schemes are used. To map out the photodissociation cross-section of the radical, the photodissociation laser is scanned and the total photofragment yield is measured as a function of wavelength. In other experiments, the photodissociation frequency is fixed and the photofragment masses, kinetic energy release, and scattering angle is determined for each photodissociation event.

1346 (BNL–48923, pp. 254-256) **Quantitative imaging of turbulent and reacting flows.** Paul, P.H. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Quantitative digital imaging, using planar laser light scattering techniques is being developed for the analysis of turbulent and reacting flows. Quantitative image data, implying both a direct relation to flowfield variables as well as sufficient signal and spatial dynamic range, can be readily processed to yield two-dimensional distributions of flowfield scalars and in turn two-dimensional images of gradients and turbulence scales. Much of the development of imaging techniques to date has concentrated on understanding the requisite molecular spectroscopy and collision dynamics to be able to determine how flowfield variable information is encoded into the measured signal. From this standpoint the image is seen as a collection of single point measurements. The present effort aims at realizing necessary improvements in signal and spatial dynamic range, signal-to-noise ratio and spatial resolution in the imaging system as well as developing excitation/detection strategies which provide for a quantitative measure of particular flowfield scalars. The standard camera used for the study is an intensified CCD array operated in a conventional video format. The design of the system was based on detailed modeling of signal and image transfer properties of fast UV imaging lenses, image intensifiers and CCD detector arrays. While this system is suitable for direct scalar imaging, derived quantities (e.g. temperature or velocity images) require an exceptionally wide dynamic range imaging detector. To apply these diagnostics to reacting flows also requires a very fast shuttered camera. The authors have developed and successfully tested a new type of gated low-light level detector. This system relies on fast switching of proximity focused image-diode which is direct fiber-optic coupled to a cooled CCD array. Tests on this new detector show significant improvements in detection limit, dynamic range and spatial resolution as compared to microchannel plate intensified arrays.

1347 (BNL–48923, pp. 257-260) **Molecular eigenstate spectroscopy: Application to the intramolecular dynamics of some polyatomic molecules in the 3000 to 7000 cm^{-1} region.** Perry, D.S. (Univ. of Akron, OH (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Intramolecular vibrational redistribution (IVR) appears to be a universal property of polyatomic molecules in energy regions where the vibrational density of states is greater than about 5 to 30 states per cm^{-1}. Interest in IVR stems from its central importance to the spectroscopy, photochemistry, and reaction kinetics of these molecules. A bright state, φ_B, which may be a C-H stretching vibration, carries the oscillator strength from the ground state. This bright state may mix with bath rotational-vibrational levels to form a clump of molecular eigenstates, each of which carries a portion of

the oscillator strength from the ground state. In this work the authors explicitly resolve transitions to each of these molecular eigenstates. Detailed information about the nature of IVR is contained in the frequencies and intensities of the observed discrete transitions. The primary goal of this research is to probe the coupling mechanisms by which IVR takes place. The most fundamental distinction to be made is between anharmonic coupling which is independent of molecular rotation and rotationally-mediated coupling. The authors are also interested in the rate at which IVR takes place. Measurements are strictly in the frequency domain but information is obtained about the decay of the zero order state, φ_s, which could be prepared in a hypothetical experiment as a coherent excitation of the clump of molecular eigenstates. As the coherent superposition dephases, the energy would flow from the initially prepared mode into nearby overtones and combinations of lower frequency vibrational modes. The decay of the initially prepared mode is related to a pure sequence infrared absorption spectrum by a Fourier transform.

1348 (BNL–48923, pp. 261-264) **Reaction and diffusion in turbulent combustion.** Pope, S.B. (Mechanical and Aerospace Engineering, Ithaca, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The motivation for this project is the need to obtain a better quantitative understanding of the technologically-important phenomenon of turbulent combustion. In nearly all applications in which fuel is burned-for example, fossil-fuel power plants, furnaces, gas-turbines and internal-combustion engines-the combustion takes place in a turbulent flow. Designers continually demand more quantitative information about this phenomenon-in the form of turbulent combustion models-so that they can design equipment with increased efficiency and decreased environmental impact. For some time the PI has been developing a class of turbulent combustion models known as PDF methods. These methods have the important virtue that both convection and reaction can be treated without turbulence-modelling assumptions. However, a mixing model is required to account for the effects of molecular diffusion. Currently, the available mixing models are known to have some significant defects. The major motivation of the project is to seek a better understanding of molecular diffusion in turbulent reactive flows, and hence to develop a better mixing model.

1349 (BNL–48923, pp. 265-267) **Analysis of forward and inverse problems in chemical dynamics and spectroscopy.** Rabitz, H. (Princeton Univ., NJ (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The overall scope of this research concerns the development and application of forward and inverse analysis tools for problems in chemical dynamics and chemical kinetics. The chemical dynamics work is specifically associated with relating features in potential surfaces and resultant dynamical behavior. The analogous inverse research aims to provide stable algorithms for extracting potential surfaces from laboratory data. In the case of chemical kinetics, the focus is on the development of systematic means to reduce the complexity of chemical kinetic models. Recent progress in these directions is summarized below.

1350 (BNL–48923, pp. 279-282) **Applications of laser-induced gratings to spectroscopy and dynamics.** Rohlfing, E.A. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This program has traditionally emphasized two principal areas of research. The first is the spectroscopic characterization of large-amplitude motion on the ground-state potential surface of small, transient molecules. The second is the reactivity of carbonaceous clusters and its relevance to soot and fullerene formation in combustion. Motivated initially by the desire to find improved methods of obtaining stimulated emission pumping (SEP) spectra of transients, most of our recent work has centered on the use of laser-induced gratings or resonant four-wave mixing in free-jet expansions. These techniques show great promise for several chemical applications, including molecular spectroscopy and photodissociation dynamics. The author describes recent applications of two-color laser-induced grating spectroscopy (LIGS) to obtain background-free SEP spectra of transients and double resonance spectra of nonfluorescing species, and the use of photofragment transient gratings to probe photodissociation dynamics.

1351 (BNL–48923, pp. 283-286) **Electronic structure, molecular bonding and potential energy surfaces.** Ruedenberg, K. (Ames Laboratory, IA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

By virtue of the universal validity of the generalized Born-Oppenheimer separation, potential energy surfaces (PES') represent the central conceptual as well as quantitative entities of chemical physics and provide the basis for the understanding of most physicochemical phenomena in many diverse fields. The research in this group deals with the elucidation of general properties of PES' as well as with the quantitative determination of PES' for concrete systems, in particular pertaining to reactions involving carbon, oxygen, nitrogen and hydrogen molecules.

1352 (BNL–48923, pp. 287-290) **The attractive quartet potential energy surface for the CH($a^4\sigma^-$) + CO reaction: A role for the a ^{4}A" state of the ketenyl radical in combustion?.** Schaefer, H.F. III (Univ. of Georgia, Athens (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Ab initio quantum mechanical techniques, including the self-consistent field (SCF), single and double excitation configuration interaction (CISD), single and double excitation double cluster (CCSD), and the single, double and perturbative triple excitation coupled cluster [CCSD(T)] methods have been applied to study the HCCO($a\ ^4A''$) energy hypersurface. Rate constant measurements suggest an attractive potential for the reaction of CH($a\ ^4\sigma^-$) with CO, and a vanishingly small energy barrier is predicted here in the CH($a\ ^4\sigma^-$) + CO reaction channel. The $^4A''$ state of HCCO is predicted to be bound by about 30 kcal/mol with respect to separated CH($a\ ^4\sigma^-$) + CO. The authors propose that a spin-forbidden electronic deactivation of CH($a\ ^4\sigma^-$) might occur through through an intersystem crossing involving the $^4A''$ state of HCCO. The energetics and the geometries of the reactants and products on both quartet and doublet energy surfaces are presented. The relationship between this research and experimental combustion chemistry has been explored.

1353 (BNL–48923, pp. 291-293) **Theoretical studies of chemical reaction dynamics.** Schatz, G.C. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This collaborative program with the Theoretical Chemistry Group at Argonne involves theoretical studies of gas phase chemical reactions and related energy transfer and photodissociation processes. Many of the reactions studied are of direct relevance to combustion; others are selected they provide important examples of special dynamical processes, or are of relevance to experimental measurements. Both classical trajectory and quantum reactive scattering methods are used for these studies, and the types of information determined range from thermal rate constants to state to state differential cross sections.

1354 (BNL–48923, pp. 294-297) **NO concentration imaging in turbulent nonpremixed flames.** Schefer, R.W. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The importance of NO as a pollutant species is well known. An understanding of the formation characteristics of NO in turbulent hydrocarbon flames is important to both the desired reduction of pollutant emissions and the validation of proposed models for turbulent reacting flows. Of particular interest is the relationship between NO formation and the local flame zone, in which the fuel is oxidized and primary heat release occurs. Planar imaging of NO provides the multipoint statistics needed to relate NO formation to the both the flame zone and the local turbulence characteristics. Planar imaging of NO has been demonstrated in turbulent flames where NO was seeded into the flow at high concentrations (2000 ppm) to determine the gas temperature distribution. The NO concentrations in these experiments were significantly higher than those expected in typical hydrocarbon-air flames, which require a much lower detectability limit for NO measurements. An imaging technique based on laser-induced fluorescence with sufficient sensitivity to study the NO formation mechanism in the stabilization region of turbulent lifted-jet methane flames.

1355 (BNL–48923, pp. 298-301) **Theoretical studies of potential energy surfaces and computational methods.** Shepard, R. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This project involves the development, implementation, and application of theoretical methods for the calculation and characterization of potential energy surfaces involving molecular species that occur in hydrocarbon combustion. These potential energy surfaces require an accurate and balanced treatment of reactants, intermediates, and products. This difficult challenge is met with general multiconfiguration self-consistent-field (MCSCF) and multireference single- and double-excitation configuration interaction (MRSDCI) methods. In contrast to the more common single-reference electronic structure methods, this approach is capable of describing accurately molecular systems that are highly distorted away from their equilibrium geometries, including reactant, fragment, and transition-state geometries, and of describing regions of the potential surface that are associated with electronic wave functions of widely varying nature. The MCSCF reference wave functions are designed to be sufficiently flexible to describe qualitatively the changes in the electronic structure over the broad range of geometries of interest. The necessary mixing of ionic, covalent, and Rydberg contributions, along with the appropriate treatment of the different electron-spin components (e.g. closed shell, high-spin open-shell, low-spin open shell, radical, diradical, etc.) of the wave functions, are treated correctly at this level. Further treatment of electron correlation effects is included using large scale multireference CI wave functions, particularly including the single and double excitations relative to the MCSCF reference space. This leads to the most flexible and accurate large-scale MRSDCI wave functions that have been used to date in global PES studies.

1356 (BNL–48923, pp. 302-303) **Computatonal and experimental study of laminar flames.** Smooke, M.D. (Yale Univ., New Haven, CT (United States)); Long, M.B. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

This research has centered on an investigation of the effects of complex chemistry and detailed transport on the structure and extinction of hydrocarbon flames in counterflow, cylindrical and coflowing axisymmetric configurations. The authors have pursued both computational and experimental aspects of the research in parallel. The computational work has focused on the application of accurate and efficient numerical methods for the solution of the one and two-dimensional nonlinear boundary value problems describing the various reacting systems. Detailed experimental measurements were performed on axisymmetric coflow flames using two-dimensional imaging techniques. In particular, spontaneous Raman scattering and laser induced fluorescence were used to measure the temperature, major and minor species profiles.

1357 (BNL–48923, pp. 304-307) **Turbulent combustion.** Talbot, L. (Lawrence Berkeley Laboratory, CA (United States)); Cheng, R.K. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Turbulent combustion is the dominant process in heat and power generating systems. Its most significant aspect is to enhance the burning rate and volumetric power density. Turbulent mixing, however, also influences the chemical rates and has a direct effect on the formation of pollutants, flame ignition and extinction. Therefore, research and development of modern combustion systems for power generation, waste incineration and material synthesis must rely on a fundamental understanding of the physical effect of turbulence on combustion to develop theoretical models that can be used as design tools. The overall objective of this program is to investigate, primarily experimentally, the interaction and coupling between turbulence and combustion. These processes are complex and are characterized by scalar and velocity fluctuations with time and length scales spanning several orders of magnitude. They are also influenced by the so-called "field" effects associated with the characteristics of the flow and burner geometries. The authors' approach is to gain a fundamental understanding by investigating idealized laboratory flames. Laboratory flames are amenable to detailed interrogation by laser diagnostics and their flow geometries are chosen to simplify numerical modeling and simulations and to facilitate comparison between experiments and theory.

1358 (BNL–48923, pp. 308-311) **Measuring ultrashort pulses using frequency-resolved optical gating.** Trebino, R. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The purpose of this program is the development of techniques for the measurement of ultrafast events important in gas-phase combustion chemistry. Specifically, goals of this program include the development of fundamental concepts and spectroscopic techniques that will augment the information currently available with ultrafast laser techniques. Of equal importance is the development of technology for ultrafast spectroscopy. For example, methods for the production and measurement of ultrashort pulses at wavelengths important for these studies is an important goal. Because the specific vibrational motion excited in a molecule depends sensitively on the intensity, I(t), and the phase, $\psi(t)$, of the ultrashort pulse used to excite the motion, it is critical to measure both of these quantities for an individual pulse. Unfortunately, this has remained an unsolved problem for many years. Fortunately, this year, the authors present a technique that achieves this goal.

1359 (BNL–48923, pp. 312-315) **Variational transition state theory.** Truhlar, D.G. (Univ. of Minnesota, Minneapolis (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This research program involves the development of variational transition state theory (VTST) and semiclassical tunneling methods for the calculation of gas-phase reaction rates and selected applications. The applications are selected for their fundamental interest and/or their relevance to combustion.

1360 (BNL–48923, pp. 316-319) **Kinetic data base for combustion modeling.** Tsang, W. (National Institute of Standards and Technology, Gaithersburg, MD (United States)); Herron, J.T. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The aim of this work is to develop a set of evaluated rate constants for use in the simulation of hydrocarbon combustion. The approach has been to begin with the small molecules and then introduce larger species with the various structural elements that can be found in all hydrocarbon fuels and decomposition products. Currently, the data base contains most of the species present in combustion systems with up to four carbon atoms. Thus, practically all the structural grouping found in aliphatic compounds have now been captured. The direction of future work is the addition of aromatic compounds to the data base.

1361 (BNL–48923, pp. 320-323) **Kinetic and mechanistic studies of free-radical reactions in combustion.** Tully, F.P. (Sandia National Laboratories, Livermore, CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

Combustion is driven by energy-releasing chemical reactions. Free radicals that participate in chain reactions carry the combustion process from reactants to products. Research in chemical kinetics enables us to understand the microscopic mechanisms involved in individual chemical reactions as well as to determine the rates at which they proceed. Both types of information are required for an understanding of how flames burn, why engines knock, how to minimize the production of pollutants, and many other important questions in combustion. In this program the authors emphasize accurate measurements over wide temperature ranges of the rates at which ubiquitous free radicals react with stable molecules. The authors investigate a variety of OH, CN, and CH + stable molecule reactions important to fuel conversion, emphasizing application of the extraordinarily precise technique of laser photolysis/continuous-wave laser-induced fluorescence (LP/cwLIF). This precision enables kinetic measurements to serve as mechanistic probes. Since considerable effort is required to study each individual reaction, prudent selection is critical. Two factors encourage selection of a specific reaction: (1) the rates and mechanisms of the subject reaction are required input to a combustion model; and (2) the reaction is a chemical prototype which, upon characterization, will provide fundamental insight into chemical reactivity, facilitate estimation of kinetic parameters for similar reactions, and constrain and test the computational limits of reaction-rate theory. Most studies performed in this project satisfy both conditions.

1362 (BNL–48923, pp. 324-327) **Single-collision studies of energy transfer and chemical reaction.** Valentini, J.J. (Columbia Univ., New York, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The research focus in this group is state-to-state dynamics of reaction and energy transfer in collisions of free radicals such as H, OH, and CH_3 with H_2, alkanes, alcohols and other hydrogen-containing molecules. The motivation for the work is the desire to provide a detailed understanding of the chemical dynamics of prototype reactions that are important in the production and utilization of energy sources, most importantly in combustion. The work is primarily experimental, but with an important and growing theoretical/computational component. The focus of this research program is now on reactions in which at least one of the reactants and one of the products is polyatomic. The objective is to determine how the high dimensionality of the reactants and products differentiates such reactions from atom + diatom reactions of the same kinematics and energetics. The experiments use highly time-resolved laser spectroscopic methods to prepare reactant states and analyze the states of the products on a single-collision time scale. The primary spectroscopic tool for product state analysis is coherent anti-Stokes Raman scattering (CARS) spectroscopy. CARS is used because of its generality and because the extraction of quantum state populations from CARS spectra is straightforward. The combination of the generality and easy analysis of CARS makes possible absolute cross section measurements (both state-to-state and total), a particularly valuable capability for characterizing reactive and inelastic collisions. Reactant free radicals are produced by laser photolysis of appropriate precursors. For reactant vibrational excitation stimulated Raman techniques are being developed and implemented.

1363 (BNL–48923, pp. 328-330) **Theoretical studies of the dynamics of chemical reactions.** Wagner, A.F. (Argonne National Laboratory, IL (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

Recent research effort has focussed on several reactions pertinent to combustion. The formation of the formyl radical from atomic hydrogen and carbon monoxide, recombination of alkyl radicals and halo-alkyl radicals with halogen atoms, and the thermal dissociation of hydrogen cyanide and acetylene have been studied by modeling. In addition, the inelastic collisions of NCO with helium have been investigated.

1364 (BNL–48923, pp. 331-334) **Infrared spectroscopy of organic free radicals related to combustion processes.** Weisshaar, J.C. (Univ. of Wisconsin, Madison (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The primary long-term goal of this work is to develop new techniques for measuring vibrational spectra of polyatomic neutral free radicals. The authors explore a variation of resonant two-photon ionization (R2PI) in which tunable ω_{IR} excites the radical vibrationally and ω_{UV} selectively ionizes only the vibrationally excited molecules. Development of the IR + UV R2PI experiment is underway. In the meantime, the authors have used optical R2PI and pulsed field ionization (PFI) detection to obtain new vibrational spectra of species such as the benzyl and phenylsilane cations. In benzyl, a great deal was learned about the vibronic coupling mechanism in the mixed q^2A_2-2^2B_2 system near 450 nm by projecting the mixed states onto the manifold of cation vibrational states. In phenylsilane$^+$, we find that the sixfold barrier to internal rotation of the silyl group is small (V_6 = +19 cm^{-1}). We are beginning to understand the mechanisms of coupling of torsional states with vibration, overall rotation, and other electronic states. In addition, we are developing a new model of internal rotation in aromatic compounds based on Prof. Frank Weinhold's natural resonance theory.

1365 (BNL–48923, pp. 335-338) **Chemical kinetics modeling.** Westbrook, C.K. (Lawrence Livermore National Laboratory, CA (United States)); Pitz, W.J. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This project emphasizes numerical modeling of chemical kinetics of combustion, including applications in both practical combustion systems and in controlled laboratory experiments. Elementary reaction rate parameters are combined into mechanisms which then describe the overall reaction of the fuels being studied. Detailed sensitivity analyses are used to identify those reaction rates and product species distributions to which the results are most sensitive and therefore warrant the greatest attention from other experimental and theoretical research programs. Experimental data from a variety of environments are combined together to validate the reaction mechanisms, including results from laminar flames, shock tubes, flow systems, detonations, and even internal combustion engines.

1366 (BNL–48923, pp. 339-342) **Probing flame chemistry with MBMS, theory, and modeling.** Westmoreland, P.R. (Univ. of Massachusetts, Amherst (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS.

The objective is to establish kinetics of combustion and molecular-weight growth in C_3 hydrocarbon flames as part of an ongoing study of flame chemistry. Specific reactions being studied are (1) the growth reactions of C_3H_5 and C_3H_3 with themselves and with unsaturated hydrocarbons and (2) the oxidation reactions of O and OH with C_3's. This approach combines molecular-beam mass spectrometry (MBMS) experiments on low-pressure flat flames; theoretical predictions of rate constants by thermochemical kinetics, Bimolecular Quantum-RRK, RRKM, and master-equation theory; and whole-flame modeling using full mechanisms of elementary reactions.

1367 (BNL–48923, pp. 358-361) **Theoretical studies of nonadiabatic and spin-forbidden processes: Investigations of the reactions and spectroscopy of radical species relevant to combustion reactions and diagnostics.** Yarkony, D.R. (Johns Hopkins Univ., Baltimore, MD (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

This research program focusses on studies of spin-forbidden and electronically nonadiabatic processes involving radical species relevant to combustion reactions and combustion diagnostics. To study the electronic structure aspects of these processes a unique and powerful system of electronic structure programs, developed over the past nine years, the BROOKLYN codes, is employed. These programs enable the authors to address questions basic to the understanding of elementary combustion processes not tractable using more standard quantum chemistry codes.

1368 (DOE/ER/13988–T2) **[Mechanism and enhancement of flame stabilization]: [Annual report, 1993–1994].** Princeton Univ., NJ (United States). Dept. of Mechanical and Aerospace Engineering. [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER13988. Order Number DE94002181. Source: OSTI; NTIS; GPO Dep.

During this period, the following projects were completed: structural invariance of purely strained planar premixed flames, thermophoretic effects on seeding particles in LDV measurements, analysis of geometry of Bunsen flames, flame propagation in periodic flow fields, adiabatic flame stabilization, and chain-thermal theory of flame extinction.

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1369 (K/CSD/TM–93-Rev.2) **Project Records Information System (PRIS) user's manual: Revision 2.** Schwarz, R.K. (ed.); Cline, B.E.; Smith, P.S. Oak Ridge K-25 Site, TN (United States). Oct 1993. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. Order Number DE94001548. Source: OSTI; NTIS; GPO Dep.

The Project Records Information System (PRIS) is an interactive system developed for the Information Services Division (ISD) of Martin Marietta Energy Systems, Inc., to perform indexing, maintenance, and retrieval of information about Engineering project record documents for which they are responsible. This PRIS User's Manual provides instruction on the use of this system. Section 2.0 of this manual presents an overview of PRIS, describing the system's purpose; the data that it handles; functions it performs; hardware, software, and access; and help and error functions. Section 3.0 describes the interactive menu-driven operation of PRIS. Appendixes A, B, and C contain help screens, report descriptions, and the data dictionary, respectively.

1370 (UCRL-ID–114972) **SERS internship Fall 1992–Spring 1993: Abstract and research papers.** Lawrence Livermore National Lab., CA (United States). 5 Aug 1993. 502p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000408. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the abstracts and research papers by students on a variety of topics in engineering, genetics, solid state physics, thermonuclear energy, astrophysics, and other science related topics.

1371 (WSRC-TR–91-106) **Uncertainty and calibration analysis.** Coutts, D.A. Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1991. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001416. Source: OSTI; NTIS; GPO Dep.

All measurements contain some deviation from the true value which is being measured. In the common vernacular this deviation between the true value and the measured value is called an inaccuracy, an error, or a mistake. Since all measurements contain errors, it is necessary to accept that there is a limit to how accurate a measurement can be. The undertainty interval combined with the confidence level, is one measure of the accuracy for a measurement or value. Without a statement of uncertainty (or a similar parameter) it is not possible to evaluate if the accuracy of the measurement, or data, is appropriate. The preparation of technical reports, calibration evaluations, and design calculations should consider the accuracy of measurements and data being used. There are many methods to accomplish this. This report provides a consistent method for the handling of measurement tolerances, calibration evaluations and uncertainty calculations. The SRS Quality Assurance (QA) Program requires that the uncertainty of technical data and instrument calibrations be acknowledged and estimated. The QA Program makes some specific technical requirements related to the subject but does not provide a philosophy or method on how uncertainty should be estimated. This report was prepared to provide a technical basis to support the calculation of uncertainties and the calibration of measurement and test equipment for any activity within the Experimental Thermal-Hydraulics (ETH) Group. The methods proposed in this report provide a graded approach for estimating the uncertainty of measurements, data, and calibrations. The method is based on the national consensus standard, ANSI/ASME PTC 19.1.

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Refer also to citation(s) 157, 188, 189, 190, 191, 192, 194, 195, 196, 198, 199, 200, 201, 202, 203, 228, 254, 307, 370, 439, 446, 447, 819, 919, 1016, 1549, 1622, 1804, 1840, 1869, 1884, 2225, 2246, 2879

1372 (ANL/RE/CP–80234) **Monitoring of soft high damping elastomeric bearings for earthquake isolation.** Coveney, V.A. (Bristol Polytechnic (United Kingdom)); Kuroda, T.; Kobatake, M.; Nita, Y.; Kulak, R.F.; Chang, Y.W.; Seidensticker, R.W. Argonne National Lab., IL (United States). [1993]. 7p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. CES-8800871. (CONF-9307136–1: 5. international congress on condition monitoring and diagnostic engineering management, Bristol (United Kingdom), 21-23 Jul 1993). Order Number DE93017409. Source: OSTI; NTIS; GPO Dep.

Over the last 20 years several practical systems for the protection of buildings and their contents against the effects of earthquakes were developed. These systems rely on effectively decoupling the building from the strong horizontal ground accelerations that are some of the most damaging features of an earthquake. The isolation of small buildings against earthquakes poses particular problems for high damping elastomer. systems. It was recognized that one way to overcome these problems was to use elastomers with particularly low moduli, high damping and other necessary characteristics. This paper describes some key features of the development of soft high damping natural bearings. Their use for the earthquake isolation of a small highly instrumented building at Tohoku University in Sendai, Japan is discussed. The paper focuses on the monitoring of the bearings during production and their performance in situ under static and earthquake (dynamic) conditions.

1373 (CEA-CONF–11505) **Effects of the particle penetration inside the filter medium on the Hepa filter pressure drop.** Letourneau, P. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations); Vendel, J.; Renaudin, V. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 15p. (CONF-920823–: 22. Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) nuclear air cleaning and treatment conference, Denver, CO (United States), 24-27 Aug 1992). Order Number DE94604539. Source: OSTI; NTIS (US Sales Only); INIS.

Filter pressure drop modelization as a function of the deposited aerosols mass requires to know the penetration profile of the particles inside the filter medium and to take into account the evolution of the internal structure of the filter. These two parameters can be determined by combining two models: a filter efficiency modelization to calculate the mass deposited in the filter, a filter pressure drop model to evaluate the change of the internal filter structure. Different hypothesis are made concerning the shape of the penetration profile. It seems, according to experimental results, that to take into account an unlike evolution of the internal filter structure according to the depth inside the medium leads to a satisfactory description of the pressure drop.

1374 (CONF-930403–54) **Parametric design studies of long-reach manipulators.** Kwon, D.S.; March-Leuba, S.; Babcock, S.M.; Burks, B.L.; Hamel, W.R. Oak Ridge National Lab., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. topical meeting on robotics and remote systems; Knoxville, TN (United States); 26-29 Apr 1993. Order Number DE94002456. Source: OSTI; NTIS; INIS; GPO Dep.

A number of different approaches have been studied for remediation of waste storage tanks at various sites. One of the most promising approaches is the use of a high-capacity, long-reach manipulation (LRM) system with a variety of end effectors for dislodging the waste. LRMs may have characteristics significantly different from those of industrial robots due to the long links needed to cover the large workspace. Because link lengths are much greater than their diameters, link flexibility, as well as joint or drive train flexibility, is likely to be significant. LRMs will be required for a variety of applications in the Environmental Restoration and Waste Management Program. While each application will present specific functional, kinematic, and performance requirements, a design approach for determining the kinematic applicability and performance characteristics considering link flexibility is presented with a focus on waste storage tank remediation. This paper addresses key design issues for LRM-based waste retrieval systems. It discusses the effects of parameters such as payload capacity, storage tanks size, and access port diameter on manipulator structural design. The estimated weight, fundamental natural frequency, and static deflection of the manipulator have been calculated for various parameter conditions.

1375 (CONF-930907–13) **Validation of SCALE-4 criticality sequences using ENDF/B-V data.** Bowman, S.M. (Oak Ridge National Lab., TN (United States)); Wright, R.Q.; DeHart, M.D.; Taniuchi, H. Oak Ridge National Lab., TN (United States). [1993]. 11p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From ANS topical meeting on physics and methods in criticality safety; Nashville, TN (United States); 19-23 Sep 1993. Order Number DE94000473. Source: OSTI; NTIS; INIS; GPO Dep.

The SCALE code system developed at Oak Ridge National Laboratory contains criticality safety analysis sequences that include the KENO V.a Monte Carlo code for calculation of the effective multiplication factor. These sequences are widely used for criticality safety analyses performed both in the United States and abroad. The purpose of the current work is to validate the SCALE-4 criticality sequences with an ENDF/B-V cross-section library for future distribution with SCALE-4. The library used for this validation is a broad-group library (44 groups) collapsed from the 238-group SCALE library. Extensive data testing of both the 238-group and the 44-group libraries included 10 fast and 18 thermal CSEWG benchmarks and 5 other fast benchmarks. Both libraries contain approximately 300 nuclides and are, therefore, capable of modeling most systems, including those containing spent fuel or radioactive waste. The validation of the broad-group library used 93 critical experiments as benchmarks. The range of experiments included 60 light-water-reactor fuel rod lattices, 13 mixed-oxide fuel rod lattice, and 15 other low- and high-enriched uranium critical assemblies.

1376 (CONF-9310102–21) **Modal combination in response spectrum modal dynamic analysis.** Hammond, C.R.; Singhal, M.K. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993. Order Number DE94000339. Source: OSTI; NTIS; GPO Dep.

UCRL-15910 does not give explicit requirements for combining the values of the resonse of individual modes in a response spectrum modal dynamic analysis. Since UCRL-15910 references ASE 4-86, modal combination methods given in ASCE 4-86 are described in this paper. Efficient use of typical dynamic analysis computer programs while complying with ASCE 4-86 is also described.

1377 (CONF-9311107–1) **On approximate reasoning and minimal models for the development of robust outdoor vehicle navigation schemes.** Pin, F.G. Oak Ridge National Lab., TN (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From ICAR '93: 6. international conference on advanced robotics; Tokyo (Japan); 1-2 Nov 1993. Order Number DE94002193. Source: OSTI; NTIS; GPO Dep.

Outdoor sensor-based operation of autonomous robots has revealed to be an extremely challenging problem, mainly because of the difficulties encountered when attempting to represent the many uncertainties which are always present in the real world. These uncertainties are primarily due to sensor imprecisions and unpredictability of the environment, i.e., lack of full knowledge of the environment characteristics and dynamics. Two basic principles, or philosophies, and their associated methodologies are proposed in an attempt to remedy some of these difficulties. The first principle is based on the concept of "minimal model" for accomplishing given tasks and proposes to utilize only the minimum level of information and precision necessary to accomplish elemental functions of complex tasks. This approach diverges completely from the direction taken by most artificial vision studies which conventionally call for crisp and detailed analysis of every available component in the perception data. the paper will first review the basic concepts of this approach and will discuss its pragmatic feasibility when embodied in a behaviorist framework. The second principle which is proposed deals with implicit representation of uncertainties using Fuzzy Set Theory-based approximations and approximate reasoning, rather than explicit (crisp) representation through calculation and conventional propagation techniques. A framework which merges these principles and approaches is presented, and its application to the problem of sensor-based outdoor navigation of a mobile robot is discussed. Results of navigation experiments with a real car in actual outdoor environments are also discussed to illustrate the feasibility of the overall concept.

1378 (ETDE-IT–93-239) **Analysis of in-situ vibration tests of twin seismically isolated and non-isolated buildings.** Forni, M. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione); Martelli, A.; Grassi, L.; Sobrero, E.; Vestroni, F.; Bettinali, F.; Bonacina, G.; Pizzigalli, E. 1993. 13p. (CONF-930702–54: 1993 pressure vessel and piping conference, Denver, CO (United States), 25-29 Jul 1993). Order Number DE94716591. Source: OSTI; NTIS (US Sales Only).

A detailed numerical study was performed for two twin buildings - one being conventionally founded and the other being seismically isolated - which had been subjected to in-situ dynamic tests at Squillace Lido (Calabria, South of Italy) in 1991. When their construction was near to completion and are now being equipped with a seismic monitoring system. Calculations concerned both the analysis of test data for the validation and calibration of numerical models and the evaluation of the seismic response of the completed structures under rather strong earthquakes corresponding to

Italian records for hard, medium and relatively soft soils. After summarizing the main features and results of the experimental campaign, the paper focuses on the numerical study.

1379 (ETDE-IT–93-246) **Developments of seismic isolation implementation in Italy.** Martelli, A. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione); Forni, M.; Bettinali, F.; Bonacina, G.; Marioni, A.; Mazzieri, C.; Serino, G. 1993. 16p. (CONF-930702–53: 1993 pressure vessel and piping conference, Denver, CO (United States), 25-29 Jul 1993). Order Number DE94716603. Source: OSTI; NTIS (US Sales Only).

This paper summarizes activities being performed in Italy for seismic isolation development and application focussing on the progress made with respect to work presented at the 1991 ASME-PVP Conference. More precisely, information is provided as to the progress on: national and international collaboration; construction of isolated buildings; features of isolation bearings; development of design guidelines and standards for isolated structures; experiments on rubber specimens, individual isolators, isolated structure mock-ups and isolated buildings; seismic monitoring of isolated buildings; development of simple and detailed numerical models for bearings and isolated structures. Furthermore, new activity plans are mentioned.

1380 (ETDE/JP-mf–94714745, pp. 10-16) **Energy conservation by developing a self-rotation type air blowing nozzle.** Nissan Motor Co. Ltd., Tokyo (Japan). 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

The cleaning unit marks the highest energy consumption among units used in the axle manufacturing plant. Among the types of energy, the rate of air consumption is the highest. The cleaning unit uses air by blowing works with air in order to allow cleaning works to get dry. Such an air blowing method is not effective, and excessive amount of air is used for air blowing. In order to reduce the rate of air consumption in the air blowing work, a self-rotation type air blowing nozzle has been developed. This nozzle blows air at an angle, thereby enabling the nozzle to blow air even larger work than the nozzle main unit. A model hanger was made, and a test was conducted on dried state by using the same hanger speed as the on-line speed. Consequently, practical use of the self -rotation type air blowing nozzle was confirmed. The merit by the development of the new nozzle was estimated to be about 2 million yen/ year. 13 figs., 3 tabs.

1381 (LA-UR–93-3389) **Design of a 400 MW power supply for a 60 T pulsed magnet.** Schillig, J.B.; Boenig, H.J.; Rogers, J.D.; Sims, J.R. Los Alamos National Lab., NM (United States). 1993. 5p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–6: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000763. Source: OSTI; NTIS; GPO Dep.

The National High Magnetic Field Laboratory at Los Alamos designs a magnet that produces magnetic fields of up to 60 T for as long as 100 ms. The power and energy to operate the magnet is provided by a 1430 MVA, 24kV energy storage generator. Three modular design power supplies convert the ac-power produced by the generator into controlled dc-power needed by the three coil groups of the eight coil magnet. The modules are rated at 4kV no-load voltage and 20 kA full-load current for up to 2 seconds once every hour, each including a 12-pulse, line-commutated rectifier designed to operate in the 66 Hz to 42 Hz pulse operation range of the generator. A short description of the overall 60 T /100 ms magnet system is given, followed by a detailed description of the power converter system design.

1382 (LA-UR–93-3432) **Computer controlled precision optical polishing on the diamond turning machine.** Hannah, P.R.; Day, R.D.; Hatch, D. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311102–3: American Society for Precision Engineering (ASPE) conference, Seattle, WA (United States), 7-12 Nov 1993). Order Number DE94000707. Source: OSTI; NTIS; GPO Dep.

This abstract reports the force and wear data required to predict the material removal, or wear, for the Numerical controlled (N/C) polishing program. The program's aim is to provide the operator of a N/C diamond turning machine or N/C grinding machine with the wear characteristics necessary to achieve uniform material removal. The first phase of the program looks at a rotating polishing wheel, moving from near the center to edge of a rotating glass disc. future phases will look at more complex shapes.

1383 (LA-UR–93-3466) **Prototype tests and description of a 60 tesla quasi-continuous magnet.** Sims, J.R.; Dominguez, T.; Northington, T.E.; Pacheco, M.D.; Rickel, D.G.; Robinson, E.L.; Rogers, J.D.; Schillig, J.B. Los Alamos National Lab., NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–4: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000683. Source: OSTI; NTIS; GPO Dep.

The National High Magnetic Field Laboratory has designed and will build a large ore, 60 tesla, 100ms (quasi continuous) flat-top magnet for installation and use at Los Alamos. The magnet consists of eight concentric, resistive, solenoid coils fabricated from high strength, high conductivity copper supported by external stainless steel shells. Before each pulse the magnet is cooled to 77 K with liquid nitrogen. The energy for the magnet is provided through converter power supplies from a 1430 MVA, 24kV alternating current energy storage generator. Plans for prototype tests of full scale portions of the magnet are discussed. A detailed description of the magnet is presented along with available information on fabrication methods to be employed in its manufacture.

1384 (LA-UR–93-3518) **Reduction of the anode fall in a coaxial plasma thruster with an applied magnetic nozzle.** Scheuer, J.T. (Los Alamos National Lab., NM (United States)); Hoyt, R.P.; Schoenberg, K.F.; Gerwin, R.A.; Moses, R.W.; Henins, I.; Mayo, R.M.; Black, D.C. Los Alamos National Lab., NM (United States). 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940101–8: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94000670. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Coaxial Thruster Experiment at the Los Alamos National Laboratory has demonstrated 10 ms quasi-steady operation and ideal MHD-like performance. Previous experiments utilized an unoptimized applied magnetic configuration in which field lines intercepted both thruster electrodes. These experiments demonstrated the ability of magnetic connection between the plasma and the electrodes to control the anode fall. In this work we report on the effect of an evolved applied magnetic nozzle which provides magnetic connection of the electrodes to the bulk of the plasma without direct magnetic connection of the electrodes. This magnetic nozzle configuration significantly reduces the anode fall fraction and thus may provide a promising means of improving MPD thruster efficiency.

1385 (LA-UR–93-3715) **Design and preliminary test results of the 40 MW power supply at the National High Magnetic Field Laboratory.** Boenig, H.J. (Los Alamos National Lab., NM (United States)); Bogdan, F.; Morris, G.C.; Ferner, J.A.; Schneider-Muntau, H.J.; Rumrill, R.H.; Rumrill, R.S. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by National Science Foundation, Washington, DC (United States); Florida State Energy Office, Tallahassee, FL (United States). DOE Contract W-7405-ENG-36. (CONF-930926–20: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94002696. Source: OSTI; NTIS; INIS; GPO Dep.

Four highly stabilized, steady-state, 10 MW power supplies have been installed at the National High Magnetic Field Laboratory in Tallahassee, FL. Each supply consists of a 12.5 kV vacuum circuit breaker, two three-winding, step-down transformers, a 24-pulse rectifier with interphase reactors and freewheeling diodes, and a passive and an active filter. Two different transformer tap settings allow dc supply output voltages of 400 and 500 V. The rated current of a supply is 17 kA and each supply has a one hour overload

capability of 20 kA. The power supply output bus system, including a reversing switch at the input and 2 x 16 disconnect switches at the output, connects each supply to 16 different magnet cells. The design of the power supply is described and preliminary test results with a supply feeding a 10 MW resistive load are presented.

1386 (PNL-SA–22414) **Active damping of oscillations in a long compliant manipulator link.** Baker, C.P. (Pacific Northwest Lab., Richland, WA (United States)); Evans, M.S.; Trudnowski, D.J.; Magee, D.P. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9307126–1: 9. international conference on mathematical and computer modeling, Oxford (United Kingdom), 26-29 Jul 1993). Order Number DE93018878. Source: OSTI; NTIS; GPO Dep.

A flexible manipulator test bed consisting of a fifteen foot long fixed-free compliant beam (representing a compliant manipulator link) with a Shilling Titan II dextrous manipulator mounted on its free end has been constructed at Pacific Northwest Laboratory (PNL). A comprehensive dynamic model which includes flexible body effects has been developed at PNL using a commercially available multibody dynamics code. A linearized version of the model is used to develop control strategies which use inertial forces generated by movements of the dextrous manipulator to damp out induced oscillations in the beam. These control strategies are tested on the model and shown to be feasible, and then implemented in the flexible manipulator testbed. Results from the hardware experiments are analyzed and compared with the model results.

1387 (RFP–4727) **Seismic equipment qualification at Rocky Flats Plant: Lessons learned.** Peregoy, W.; Herring, K. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1993]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-9310102–3: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93018799. Source: OSTI; NTIS; GPO Dep.

Seismic equipment qualification is being evaluated as a part of the Systematic Evaluation Program (SEP) at Rocky Flats Plant (RFP). Initially it was believed that the experience database developed by the Seismic Qualification Utility Group (SQUG) for commercial nuclear power plants, as outlined in their Generic Implementation Procedure (GIP), would provide a substantial benefit for the seismic adequacy verification of equipment at RFP. However, further review of the simplified guidelines contained in the GIP with respect to the specific RFP structures and components revealed substantial differences from the GIP criteria. Therefore, the number of "outliers" from the experience database defined in the GIP is greater than was initially anticipated. This paper presents details of the differences found between the RFP structures and components and those represented in the GIP, and the challenges presented for their evaluation at RFP. Approaches necessary to develop seismic verification data are also discussed. The discussions focus on experience with one of the nuclear facilities at RFP, Building 707. However, the conclusions are generally applicable to other similar facilities that typically comprise the RFP nuclear facilities.

1388 (SAND–92-2115C) **ANSI N14.5 source term licensing of spent-fuel transport cask containment.** Seager, K.D. (Sandia National Labs., Albuquerque, NM (United States)); Reardon, P.C.; James, R.J.; Foadian, H.; Rashid, Y.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930702–51: 1993 pressure vessel and piping conference, Denver, CO (United States), 25-29 Jul 1993). Order Number DE94001204. Source: OSTI; NTIS; INIS; GPO Dep.

American National Standards Institute (ANSI) standard N14.5 states that "compliance with package containment requirements shall be demonstrated either by determination of the radioactive contents release rate or by measurement of a tracer material leakage rate." The maximum permissible leakage rate from the transport cask is equal to the maximum permissible release rate divided by the time-averaged volumetric concentration of suspended radioactivity within the cask. The development of source term methodologies at Sandia National Laboratories (SNL) provides a means to determine the releasable radionuclide concentrations within spent-fuel transport casks by estimating the probability of cladding breach, quantifying the amount of radioactive material released into the cask interior from the breached fuel rods, and quantifying the amount of radioactive material within the cask due to other sources. These methodologies are implemented in the Source Term Analyses for Containment Evaluations (STACE) software. In this paper, the maximum permissible leakage rates for the normal and hypothetical accident transport conditions defined by 10 CFR 71 are estimated using STACE for a given cask design, fuel assembly, and initial conditions. These calculations are based on defensible analysis techniques that credit multiple release barriers, including the cladding and the internal cask walls.

1389 (SAND–93-0922C) **Object oriented simulation implementation in support of robust system design.** Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931208–1: Winter simulation conference, Los Angeles, CA (United States), 12-15 Dec 1993). Order Number DE93011687. Source: OSTI; NTIS; GPO Dep.

A very brief description of two "classes" developed for use in design optimization and sensitivity analyses are given. These classes are used in simulations of systems in early design phases as well as system response assessments. The instanciated classes were coupled to system models to demonstrate the practically and efficiency of using these objects in complex robust design processes.

1390 (SAND–93-1420C) **Lunar exploration rover program developments.** Klarer, P.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308159–2: SOAR 93: space operations, applications, and research conference, Houston, TX (United States), 3-5 Aug 1993). Order Number DE93040759. Source: OSTI; NTIS; GPO Dep.

The Robotic All Terrain Lunar Exploration Rover (RATLER) design concept began at Sandia National Laboratories in late 1991 with a series of small, proof-of-principle, working scale models. The models proved the viability of the concept for high mobility through mechanical simplicity, and eventually received internal funding at Sandia National Laboratories for full scale, proof-of-concept prototype development. Whereas the proof-of-principle models demonstrated the mechanical design's capabilities for mobility, the full scale proof-of-concept design currently under development is intended to support field operations for experiments in telerobotics, autonomous robotic operations, telerobotic field geology, and advanced man-machine interface concepts. The development program's current status is described, including an outline of the program's work over the past year, recent accomplishments, and plans for follow-on development work.

1391 (SAND–93-1468C) **Automating the control of robotic systems in unstructured environments.** Harrigan, R.W. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308171–1: 8. Institute of Electrical and Electronics Engineers (IEEE) international symposium on intelligent control, Chicago, IL (United States), 25-27 Aug 1993). Order Number DE93040753. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department Energy's Office of Technology Development has sponsored the development of generic robotics technologies for application to a wide range of remote systems. Of primary interest is the development of technologies which enable faster, safer, and cheaper cleanup of hazardous waste sites than is possible using conventional human contact or remote manual approaches. The development of model-based sensor-directed robot control approaches supports these goals by developing modular control technologies which reduce the time and cost of development by allowing reuse of control system software. In addition, the use of computer models improves the safety of remote site cleanup by allowing automated errors detection and recovery while reducing the time for technology development.

1392 (SAND–93-1784C) **Space debris removal using a high-power ground-based laser.** Monroe, D.K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309219–1: American Institute of Aeronautics and Astronautics (AIAA) space programs and technologies conference and exhibit, Huntsville, AL (United States), 21-23 Sep 1993). Order Number DE93019082. Source: OSTI; NTIS; GPO Dep.

The feasibility of utilizing a ground-based laser without an orbital mirror for space debris removal is examined. Technical issues include atmospheric transmission losses, adaptive-optics corrections of wavefront distortions, laser field of view limitations, and laser-induced impulse generation. The physical constraints require a laser with megawatt output, long run-time capability, and wavelength with good atmospheric transmission characteristics. It is found that a 5-MW reactor-pumped laser can deorbit debris having masses of the order of one kilogram from orbital altitudes to be used by Space Station Freedom. Debris under one kilogram can be deorbited after one pass over the laser site, while larger debris can be deorbited or transferred to alternate orbits after multiple passes over the site.

1393 (SAND–93-1835C) **Graphical Programming: A systems approach for telerobotic servicing of space assets.** Pinkerton, J.T. (New Mexico Univ., Albuquerque, NM (United States). Dept. of Computer Science); McDonald, M.J.; Palmquist, R.D.; Patten, R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308159–1: SOAR 93: space operations, applications, and research conference, Houston, TX (United States), 3-5 Aug 1993). Order Number DE93019016. Source: OSTI; NTIS; INIS; GPO Dep.

Satellite servicing is in many ways analogous to subsea robotic servicing in the late 1970's. A cost effective, reliable, telerobotic capability had to be demonstrated before the oil companies invested money in deep water robot serviceable production facilities. In the same sense, aeronautic engineers will not design satellites for telerobotic servicing until such a quantifiable capability has been demonstrated. New space servicing systems will be markedly different than existing space robot systems. Past space manipulator systems, including the Space Shuttle's robot arm, have used master/slave technologies with poor fidelity, slow operating speeds and most importantly, in-orbit human operators. In contrast, new systems will be capable of precision operations, conducted at higher rates of speed, and be commanded via ground-control communication links. Challenges presented by this environment include achieving a mandated level of robustness and dependability, radiation hardening, minimum weight and power consumption, and a system which accommodates the inherent communication delay between the ground station and the satellite. There is also a need for a user interface which is easy to use, ensures collision free motions, and is capable of adjusting to an unknown workcell (for repair operations the condition of the satellite may not be known in advance). This paper describes the novel technologies required to deliver such a capability.

1394 (SAND–93-1985) **Reentry vehicle adaptive telemetry.** Kidner, R.E. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94001168. Source: OSTI; NTIS; GPO Dep.

In RF telemetry (TM) the allowable RF bandwidth limits the amount of data in the telemetered data set. Typically the data set is less than ideal to accommodate all aspects of a test. In the case of diagnostic data, the compromise often leaves insufficient diagnostic data when problems occur. As a solution, intelligence was designed into a TM, allowing it to adapt to changing data requirements. To minimize the computational requirements for an intelligent TM, a fuzzy logic inference engine was developed. This reference engine was simulated on a PC and then loaded into a TM hardware package for final testing.

1395 (SR/H–650) **ICD – Willow Bank – Heat Systems-Ultrasonics: Mystaire scrubber.** Dunson, J.B. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 27 Aug 1975. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94001991. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Mystaire is a scrubber that uses both diffusional and inertial separation. It is, therefore, both large (roughly 50 cubic feet/thousand acfm) and a fairly high power user (roughly 3.2 horsepower/thousand acfm, equivalent to 20 inches of water pressures drop). The Du Pont FBS is much smaller (roughly ten cubic feet/thousand cfm); power consumption would depend on the application. Mystaire performance at least on condensing HNO_3 mist is expected to be better than a coalescing demister; price was in the same range as a coalescing demister. The Mystaire would appear to be a potentially useful scrubber for catching ultrafine liquid fume containing no significant suspended solids. We do not yet have any quantitative performance data. I would be very cautious about applying it where solids accumulation is possible, especially directly from the vapor phase (note that raw $TiCl_4$ fume can plug even FBS pads). There are already additional units being considered for more Du Pont applications.

1396 (UCB/ERL-M–92/146) **Verification of frequency scaling laws for capacitive rf discharges using two-dimensional simulations.** Vahedi, V.; Birdsall, C.K.; Lieberman, M.A.; DiPeso, G.; Rognlien, T.D. California Univ., Berkeley, CA (United States). Electronics Research Lab. 15 Dec 1992. 35p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract FG03-90ER54079 ;W-7405-ENG-48. Grant ECS-8910827;Contract FD-N00014-90-J-1198. Order Number DE94001306. Source: OSTI; NTIS; INIS; GPO Dep.

Weakly ionized processing plasmas are studied in two-dimensions using a bounded particle-in-cell (PIC) simulation code with a Monte Carlo Collision (MCC) package. The MCC package models the collisions between charged and neutral particles, which are needed to obtain a self-sustained plasma and the proper electron and ion energy loss mechanisms. A two-dimensional capacitive RF discharge is investigated in detail. Simple frequency scaling laws for predicting the behavior of some plasma parameters are derived and then compared with simulation results, finding good agreements. We find that as the drive frequency increases, the sheath width decreases, and the bulk plasma becomes more uniform, leading to a reduction of the ion angular spread at the target and an improvement of ion dose uniformity at the driven electrode.

1397 (UCRL-JC–112638) **Automated binding of attributes to telemetry data.** Kalibjian, J.R. (Lawrence Livermore National Lab., CA (United States)); Voss, T.J.; Yio, J.J.; Hedeline, B. Lawrence Livermore National Lab., CA (United States). 26 Apr 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310131–4: 29. annual international telemetering conference, Las Vegas, NV (United States), 25-28 Oct 1993). Order Number DE94000401. Source: OSTI; NTIS; GPO Dep.

An automated method is described for binding attributes to extracted data from a telemetry steam. These attributes can be used by post processing utilities to facilitate efficient analysis. A practical implementation of such a scheme is described.

1398 (UCRL-JC–113437) **Three dimensional ultrasonic imaging.** Thomas, G.H.; Benson, S.; Crawford, S. Lawrence Livermore National Lab., CA (United States). Mar 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930445–25: Society of Photo-Optical Instrumentation Engineers (SPIE) OE/aerospace science and sensing meeting, Orlando, FL (United States), 11-16 Apr 1993). Order Number DE93040549. Source: OSTI; NTIS; GPO Dep.

Ultrasonic nondestructive evaluation techniques interrogate components with high frequency acoustic energy. A transducer generates the acoustic energy and converts acoustic energy to electrical signals. The acoustic energy is reflected by abrupt changes in modulus and/or density which can be caused by a defect. Thus defects reflect the ultrasonic energy which is converted into electrical signals. Ultrasonic evaluation typically provides a two dimensional image of internal defects. These images are either planar views (C-scans) or cross-sectional views (B-scans). The planar view is generated by raster scanning an ultrasonic transducer over the component and capturing the amplitude of internal reflections. Depth information is generally ignored. The cross-sectional view is

generated by scanning the transducer along a single line and capturing the amplitude and time of flight for each internal reflection. The amplitude and time of flight information is converted into an image of the cross section of the component where the scan was performed. By fusing the C-scan information with the B-scan information a three dimension image of the internal structure of the component can be produced. The three dimensional image can be manipulated by rotating and slicing to produce the optimal view of the internal structure. The high frequency ultrasonic energy requires a liquid coupling media and thus applications for imaging in liquid environments are well suited to ultrasonic techniques. Examples of potential ultrasonic imaging applications are: Inside liquid filled tanks, inside the human body, and underwater.

1399 (UCRL-JC–114562) **Angle interferometer cross axis errors.** Bryan, J.B.; Carter, D.L.; Thompson, S.L. Lawrence Livermore National Lab., CA (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9307138–1: LAMDAMAP 93: laser methodology and machine performance, Southhampton (United Kingdom), 13-15 Jul 1993). Order Number DE93019630. Source: OSTI; NTIS; GPO Dep.

The authors have found what appears to be a previously unreported error in the measurement of surface plate flatness and the measurement of angular displacement errors in rotary tables using angle interferometers.

1400 (UCRL-JC–115169) **Telerobotics with whole arm collision avoidance.** Wilhelmsen, K.; Strenn, S. Lawrence Livermore National Lab., CA (United States). Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309199–9: Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation, Boston, MA (United States), 7-10 Sep 1993). Order Number DE94002027. Source: OSTI; NTIS; GPO Dep.

The complexity of teleorbotic operations in a cluttered environment is exacerbated by the need to present collision information to the operator in an understandable fashion. In addition to preventing movements which will cause collisions, a system providing some form of virtual force reflection (VFR) is desirable. With this goal in mind, Lawrence Livermore National Laboratory (LLNL) has installed a kinematically master/slave system and developed a whole arm collision avoidance system which interacts directly with the telerobotic controller. LLNL has also provided a structure to allow for automated upgrades of workcell models and provide collision avoidance even in a dynamically changing workcell.

1401 (UCRL-JC–115232) **Department of Energy Natural Phenomena Hazards Mitigation Program.** Murray, R.C. Lawrence Livermore National Lab., CA (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310102–31: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94001767. Source: OSTI; NTIS; GPO Dep.

This paper will present a summary of past and present accomplishments of the Natural Phenomena Hazards Program that has been ongoing at Lawrence Livermore National Laboratory since 1975. The Natural Phenomena covered includes earthquake; winds, hurricanes, and tornadoes; flooding and precipitation; lightning; and volcanic events. The work is organized into four major areas (1) Policy, requirements, standards, and guidance (2) Technical support, research development, (3) Technology transfer, and (4) Oversight.

1402 (WHC-MR–0425) **Manhattan Project buildings and facilities at the Hanford Site: A construction history.** Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 424p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001239. Source: OSTI; NTIS; INIS; GPO Dep.

This document thoroughly examines the role that the Hanford Engineer Works played in the Manhattan project. The historical aspects of the buildings and facilities are characterized. An in depth look at the facilities, including their functions, methods of fabrication and appearance is given for the 100 AREAS, 200 AREAS, 300 AREAS, 500, 800 and 900 AREAS, 600 AREA, 700 AREA, 1100 AREA and temporary construction structures.

1403 (WHC-SA–1714) **Pitfalls in computer code use in criticality analyses.** Schwinkendorf, K.N.; Erickson, D.G.; Heer, D.L.; Toffer, H. Westinghouse Hanford Co., Richland, WA (United States). Mar 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930907–11: ANS topical meeting on physics and methods in criticality safety, Nashville, TN (United States), 19-23 Sep 1993). Order Number DE93041111. Source: OSTI; NTIS; GPO Dep.

Well-established computer codes are rendered useless if the user does not understand the underlying principles governing the code. A sampling of Monte Carlo Neutron Photon (MCNP) and KENO V.a computer code users has revealed a common misuse of the cross-section tables because of lack of foreknowledge. Cross-section tables are available to MCNP that account for molecular binding of less massive nuclei. However, the default tables are based upon collision physics of a free atom. The cross sections available to KENO V.a are based upon infinitely dilute systems. This can result in undesirable effects in criticality calculations of heterogeneous systems. This paper will describe the underlying physics and effects on criticality calculations of the various cross-section tables.

1404 (WSRC-MS–93-286) **Beneficially reusing LLRW the Savannah River Site Stainless Steel Program.** Boettinger, W.L. Westinghouse Savannah River Co., Aiken, SC (United States). 9 Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931207–1: DOE low-level radioactive waste management conference, Phoenix, AZ (United States), 1-3 Dec 1993). Order Number DE94002044. Source: OSTI; NTIS; INIS; GPO Dep.

With 68 radioactively contaminated excess Process Water Heat Exchangers the Savannah River Site launched its program to turn potential LLRW metal liabilities into assets. Each Heat Exchanger contains approximately 100 tons of 304 Stainless Steel and could be disposed as LLRW by land burial. Instead the 7000 tons of metal will be recycled into LLRW, HLW, and TRU waste containers thereby eliminating the need for near term land disposal and also eliminating the need to add more clean metal to the waste stream. Aspects of the partnership between DOE and Private Industry necessary to accomplish this new mission are described. A life cycle cost analysis associated with past practices of using carbon steel containers to indefinitely store material (contributing to the creation of today's legacy waste problems) is presented. The avoided cost calculations needed to support the economics of the "Indifference" decision process in assessing the Beneficial Reuse option relative to the Burial option are described.

1405 (WSRC-MS–93-441) **Structural integrity tests on cement fiberglass/asbestos panels.** Khosla, R. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9310102–7: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93019477. Source: OSTI; NTIS; GPO Dep.

During the seismic upgrade walkdowns of some of the Savannah River Site (SRS) facilities, a number of partition walls were encountered. These walls are constructed from 1/4 inch cement fiberglass or cement asbestos wallboard panels. Some of the partition walls are located in close proximity to safety related equipment like relay cabinets containing essential relays. Lightweight safety related equipment like electric conduits and panels are commonly attached to these walls. Occasionally, heavier equipment such as a transformer may also be found. To maintain functionality of the safety related equipment during a seismic event, structural integrity of the walls is required. Additionally, any structural failure of the walls could pose an interaction hazard to adjacently located relay cabinets result in spurious actuation of essential relays. In the absence of published structural capacities specific to SRS construction characteristics, a series of tests were performed to assess the capacity of various wall features. This paper discusses

the different types of tests performed to measure the structural capacity of various wall features. Results are presented.

1406 (WSRC-TR–93-365) **Structural response of the ITP failed filter transportation box to impact and internal pressure, Task 93-034-1.** Mertz, G.E. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1993. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001397. Source: OSTI; NTIS; GPO Dep.

The ITP failed filter containment box is used to transport the failed filter from the tank farm to the burial ground. During transportation, the ITP failed filter containment box, or "box," will be subject to internal pressure loading and possibly an impact load resulting from rough handling or an accidental drop. This report contains a structural analysis of the impact limiters and the box containment boundary, subject to pressure and impact loading.

1407 (Y/DD–613) **Experience with performance based training of nuclear criticality safety engineers.** Taylor, R.G. Oak Ridge Y-12 Plant, TN (United States). 13 Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-931160–26: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94001947. Source: OSTI; NTIS; INIS; GPO Dep.

For non-reactor nuclear facilities, the U.S. Department of Energy (DOE) does not require that nuclear criticality safety engineers demonstrate qualification for their job. It is likely, however, that more formalism will be required in the future. Current DOE requirements for those positions which do have to demonstrate qualification indicate that qualification should be achieved by using a systematic approach such as performance based training (PBT). Assuming that PBT would be an acceptable mechanism for nuclear criticality safety engineer training in a more formal environment, a site-specific analysis of the nuclear criticality safety engineer job was performed. Based on this analysis, classes are being developed and delivered to a target audience of newer nuclear criticality safety engineers. Because current interest is in developing training for selected aspects of the nuclear criticality safety engineer job, the analysis is incompletely developed in some areas.

1408 (Y/DV–1273) **Manufacturing overview at the Department of Energy Oak Ridge facilities.** Riepe, R.C. Oak Ridge Y-12 Plant, TN (United States). 20 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-9308150–11: Environmentally conscious manufacturing congress '93, Arlington, VA (United States), 30 Aug - 1 sep 1993). Order Number DE94001943. Source: OSTI; NTIS; GPO Dep.

Recent changes in the Oak Ridge Y-12 Plant mission make possible the access by industry to a national resource with a history of manufacturing high precision components from conventional, exotic, and hazardous materials. Turning, milling, grinding, and many nontraditional machining techniques combined with high- accuracy dimensional inspection, nontraditional testing, and a broad range of surface treatments/coatings support national programs requiring the highest possible quality. The Centers for Manufacturing Technology (1-800-356-4USA) at the Oak Ridge Y-12 Plant site provide an impressive mix of resources and opportunities to American industry.

1409 (Y/LF–456/R1) **Thermal analysis of the horizontal shipping container for normal conditions of transport with solar insolation.** Stumpfl, E.; Feldman, M.R.; Anderson, J.C. Oak Ridge Y-12 Plant, TN (United States). 2 Apr 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94001948. Source: OSTI; NTIS; INIS; GPO Dep.

A thermal analysis of the horizontal shipping container (HSC) was performed to determine the temperatures at the outer surface of the inner container during normal conditions of transport with incident solar radiation. There are two methods by which this analysis can be performed: (1) it can be run as a steady-state problem where it is assumed that the incident solar radiation is applied to the package 24 hours per day, or (2) it can be run as a cyclic transient problem where the incident solar radiation is applied for 12 hours per day and the other 12 hours there is assumed to be no incident solar radiation. The steady-state method was initially attempted, but the temperatures determined from this analysis were judged to be significantly higher than one would find in the cyclic case. Thus, it was deemed necessary to perform a transient analysis to determine a more realistic temperature distribution within the HSC during normal conditions of transport. The heat transfer code HEATING 7.1 was used to perform these calculations. HEATING 7.1 is a heat conduction code capable of handling radiation, convection (forced and natural), and heat flux boundary conditions. Heat generation within a material is also possible with HEATING 7.1 but was not used in any of the models presented here. The models used here are one-dimensional in the radial direction.

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Refer also to citation(s) 286, 721, 742, 747, 955, 2828, 2846

1410 (AAA-KTF/IVT–92/1) **The ADI-solver implemented on a 2D mesh of concurrent processors.** Saarinen, M. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 16p. Order Number DE94709664. Source: OSTI; NTIS.

In this study a parallel version of the ADI solver is presented. The parallel solver operates on a diffusion equation and the discretized calculation domain is decomposed in a 2D manner. The parallel program code takes advantage of the explicit features of the ADI in order to achieve higher efficiencies. Efficiencies over 50 % are observed when 4-32 concurrent processors are used

1411 (AAA-KTF/IVT–92/6) **A study on system identification of a distributed parameter system using feed-forward neural networks.** Bulsari, A.B.; Saxen, H. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 17p. Order Number DE94709666. Source: OSTI; NTIS.

Artificial neural networks have been applied to several system identification problems. However, most of those systems exclude dynamics or are lumped parameter systems. System identification of a distributed parameter system is considered in this report. The advantage of using neural networks lie in their ability to learn the process dynamics from the observations of the gross behaviour of the process, without a mathematical model. The process consists of a metal rod of constant cross section and constant (temperature invariant) specific heat, density and thermal conductivity being heated at one end and maintained at a constant temperature at the other end. 4 simulation runs were carried out to generate data on the dynamics of the process. 400 training instances were created from this data. The neural networks output changes in temperatures at sampling points over the sampling interval, based on the knowledge of the state at a given time, and the heat input to the rod. The system was identified well using feed-forward neural networks. Temperature at the heated end of the rod was not predicted as accurately as the other sampling points. When this sampling point was treated separately, using an additional input, the change in temperature at that point was also predicted accurately. Linear activation functions may be used to estimate the change in temperature at the other points.

1412 (AAA-KTF/IVT–92/10) **Mathematical modelling of fluid mixing processes: A literature review.** Roeberg, K.E. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 53p. (In Swedish). Order Number DE94709668. Source: OSTI; NTIS.

This literature review primarily deals with mixing in stirred cylindrical vessels, but other mixing equipment, as in-line mixers, are touched upon too. Methods to determinate necessary stirrer power and mixing time, also for continuous mixing, are brought forward, and some common definitions of the degree of mixing are compared. The mixing of dissoluble liquids in agitated vessels, extraction columns, in-line mixers and mixer-settler systems are discussed. Mass transfer between dissoluble liquids is also described. The influence of the mixing parameters, e. g. the influence of the rotation speed of the impeller, on the dispersion of gas into a liquid in an agitated vessel is discussed. Methods of calculation for the mass transfer between gas and liquid in agitated vessels are described. States of suspension for solid particles in liquids in stirred tanks are defined and a formula for modelling of mixing is brought forward. Three phase mixing is discussed and formulas for

modelling of mixing in agitated vessels have been put together. For heat transfer in stirred tanks provided with a jacket or tube insertions, estimating methods for the heat transfer coefficient are given. A number of equations has been transformed, so that SI-units can be used for all the equations in this report.

1413 (AAA-KTF/IVT–92/12) **Numerical simulation of the flow pattern generated by a Rushton turbine in a stirred tank.** Roeberg, K.E. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 17p. (In Swedish). Order Number DE94709670. Source: OSTI; NTIS.

This report presents a numerical simulation of the fluid flow in a cylindrical mixing vessel. The vessel is stirred by a center mounted Rushton turbine. The geometry of the vessel corresponds to a test plant, chosen from the literature, in which experimental measurements have been done, and these measurements are compared with the simulated ones. To describe the flow around the impeller blades a simplified model has been adopted. Here the area swept by the impeller blades is considered a source of angular momentum. The turbulence is described with the k - ϵ model. The commercial program PHOENICS is used for the simulations.

1414 (ANL–93/15) **Motion-dependent fluid forces acting on tube arrays in crossflow.** Chen, S.S.; Zhu, S.; Jendrzejczyk, J.A. Argonne National Lab., IL (United States). Jun 1993. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001576. Source: OSTI; NTIS; GPO Dep.

Motion-dependent fluids forces acting on a tube array were measured as a function of excitation frequency, excitation amplitude, and flow velocity. Fluid-damping and fluid-stiffness coefficients were obtained from measured motion-dependent fluid forces as a function of reduced flow velocity and excitation amplitude. The water channel and test setup provide a sound facility for obtaining key coefficients for fluidelastic instability of tube arrays in crossflow. Once the guideline, based on the unsteady flow theory, can be developed for fluidelastic instability of tube arrays crossflow.

1415 (ANL/FC/CP–76325) **Experimental analysis of natural convection within a thermosyphon.** Clarksean, R. Argonne National Lab., Idaho Falls, ID (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931087–2: 3. world conference on experimental heat transfer, fluid mechanics and thermodynamics, Honolulu, HI (United States), 31 Oct - 5 nov 1993). Order Number DE93041174. Source: OSTI; NTIS; INIS; GPO Dep.

The heat transfer characteristics of a thermosyphon designed to passively cool cylindrical heat sources are experimentally studied. The analysis is based on recognizing the physics of the flow within different regions of the thermosyphon to develop empirical heat transfer correlations. The basic system consists of three concentric cylinders, with an outer channel between the outer two cylinders, and an inner channel between the inner two cylinders. Tests were conducted. with two different process material container diameters, representing the inner cylinder, and several different power levels. The experimentally determined local and average Nu numbers for the inner channel are in good agreement with previous work for natural convection between vertical parallel plates, one uniformly heated and the other thermally insulated. The implication is that the heat transfer off of each surface is independent of the adjacent surface for sufficiently high Ra numbers. The heat transfer is independent because of limited interaction between the boundary layers at sufficiently high Ra numbers. As a result of the limited interaction, the maximum temperature within the system remained constant, or decreased slightly when the radii of the inner cylinders increased for the same amount of heat removal.

1416 (ANL/MCT/CP–79317) **Nonlinear fluid-stiffness-controlled instability of tube row in crossflow.** Chen, S.H.; Chen, S.S. Argonne National Lab., IL (United States). 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001325. Source: OSTI; NTIS; GPO Dep.

Fluidelastic instability of tube arrays in heat exchangers may become chaotic, in particular when there are clearances between the tubes and supports. When chaotic motion appears in tube arrays, significant sliding between the tubes and supports may be induced. An analytical model consisting of a row of rigid tubes with three tubes supported by springs is presented. Bifurcation diagrams, Poincare maps, power spectral densities, and tube orbits are used to investigate the conditions under which the unpredictable motion can arise. Emphasis is on fluid-stiffness-controlled instability.

1417 (CNIC–00671) **A double parameters measurement of steam-water two-phase flow with single orifice.** Zhong Shuoping (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Tong Yunxian; Yu Meiying. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 10p. (In Chinese). (TSHUNE–0051.). Order Number DE94604532. Source: OSTI; NTIS (US Sales Only); INIS.

A double parameters measurement of steam-water two-phase flow with single orifice is described. An on-line measurement device based on micro-computer has been developed. The measured r.m.s error of steam quality is less than 6.5% and the measured relative r.m.s. error of mass flow rate is less than 9%.

1418 (CNIC–00676) **Identification of two-phase flow pattern by using specific spatial frequency of differential pressure signal.** Han Bin (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Tong Yunxian; Wu Shaorong. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 8p. (in Chinese). (TSHUNE–0054.). Order Number DE94604533. Source: OSTI; NTIS (US Sales Only); INIS.

It is a classical method by using analysis of differential pressure fluctuation signal to identify two-phase flow pattern. The method which uses trait peak in the frequency-domain will result confusion between bubble flow and intermittent flow due to the influence of gas speed. Considering the spatial geometric significance of two-phase slow patterns and using the differential pressure gauge as a sensor, the Strouhal number 'Sr' is taken as the basis for distinguishing flow patterns. Using Strouhal number 'Sr' to identify flow pattern has clear physical meaning. The experimental results using the spatial analytical technique to measure the flow pattern are also given.

1419 (CONF-930675–7) **A simple model for the design of vertical tube absorbers.** Patnaik, V. (Pennsylvania State Univ., University Park, PA (United States)); Perez-Blanco, H.; Ryan, W.A. Oak Ridge National Lab., TN (United States). [1993]. 39p. Sponsored by USDOE, Washington, DC (United States); Gas Research Inst., Chicago, IL (United States). DOE Contract AC05-84OR21400. From 1993 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) summer meeting; Denver, CO (United States); 26-30 Jun 1993. Order Number DE93019164. Source: OSTI; NTIS; GPO Dep.

The absorption of water vapor in aqueous solutions of lithium bromide is modelled for a falling-film, vertical-tube absorber. The model is based on the solution of three ordinary differential equations to calculate solution bulk and interface concentration and temperature distributions and the coolant temperature distribution. The heat and mass transfer coefficients employed in the equations are extracted from the literature. In this way, the model incorporates recent information on wavy-laminar flows. Under certain conditions, the solution exhibits instabilities in the entrance region of the absorber tube, which are corrected by the introduction of a dampening factor incorporating relevant thermophysical properties. The usefulness of the model for generating absorber performance charts is demonstrated.

1420 (DOE/ER/13567–2) **[Particle dispersion by ordered motion in mixing layers].** Troutt, T.R. Washington State Univ., Pullman, WA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-86ER13567. Order Number DE93040700. Source: OSTI; NTIS; GPO Dep.

Recent research findings have determined that organized large scale vortex structures can play a dominate role in the particle dispersion process in free shear flows. The effect of these large scale vortices on the particle dispersion process is especially significant if the time scales associated with the aerodynamic response time of the particles and the large scale vortices are of the same order. Our recent experimental results demonstrate that if this time scale condition exists the particle dispersion process will be dominated

by the large scale vortices. Moreover, the particle dispersion rate can be significantly affected if forcing techniques are imposed to control the large scale structure interactions.

1421 (DOE/ER/13567–4) **[Particle dispersion by order motion in mixing layers].** Troutt, T.R. Washington State Univ., Pullman, WA (United States). [1993]. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-86ER13567. Order Number DE93040702. Source: OSTI; NTIS; GPO Dep.

Multiphase mixing in turbulent flows is a key element in many energy conversion and chemical processes. There is considerable need for improving the design and control of these processes. Free turbulent shear flows are the primary agents for particle mixing in these systems. Previous studies by this research group have shown that, if particle coupling effects are neglected, the organized vortex structures generated by these shear flows control the character of the particle mixing process. A coordinated experimental and numerical study is proposed to investigate the coupled effects of droplet mass and energy transfer on the turbulent multiphase mixing process in free shear flows. This study has important implications concerning the design of reacting flow systems. Experimental visualizations of the multiphase flow will be carried out using laser-sheet lighting and high speed photography. Local measurements of droplet size, velocity and concentration diagnostics, will be made with laser anemometry and phase Doppler diagnostics. Complementary analytical and numerical analyses will be carried out to assess the effect of coupling on vortex structure, stability and growth. The results of the proposed research will provide basic understanding concerning the coupled effects of particle concentration on the rate of multiphase mixing in turbulent flows. Information of this nature is essential to the improved designs of engineering systems with particulate or droplet flows.

1422 (DOE/MC/24207–3325) **A novel instrumented heat transfer tube for fluidization research: Topical report, January 1991–June 1992.** Turton, R.; Clark, N. West Virginia Univ., Morgantown, WV (United States). Oct 1992. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24207. Order Number DE93000261. Source: OSTI; NTIS; GPO Dep.

A novel heat transfer probe capable of measuring simultaneously the time varying heat transfer coefficient around the surface of a heat transfer tube and the time varying static pressure fluctuations in the vicinity of the tube surface was built and tested. The probe consisted of a 2" OD – 1 inch ID stainless steel tube with a surface mounted thermocouple and pressure taps above and below the thermocouple flush with the surface of the tube. Simultaneous surface temperature data and local static pressure fluctuations were measured at different fluidizing conditions in beds of fine, 250 micron, sand. Time varying heat transfer coefficients were obtained by solving the unsteady conduction equation in the wall of the tube using the surface temperature measurements as the time varying boundary condition. Heat transfer coefficients obtained by this technique were of similar magnitude to those measured in similar beds at similar conditions. The time varying static pressure fluctuations obtained from the two pressure taps mounted in the tube wall contained considerable noise which made comparison, using Fourier Transform Techniques, of the temperature and pressure data impossible. However, visual observations of the two sets of data suggest that a correlation may exist but would require the filtering or elimination of noise from the pressure transducer.

1423 (DOE/NV/10872–T59) **Main task: Visualization methods in heat transfer through porous media.** Boehm, R.F. Nevada Univ., Las Vegas, NV (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE93018959. Source: OSTI; NTIS; GPO Dep.

Information is presented on visualization methods in heat transfer through porous media; and unsaturated flow experiment with heat transfer in porous media.

1424 (INIS-mf–13723) **Heat convection in a set of three vertical cylinders.** Serrano Ramirez, M.L. de. Universidad Autonoma Metropolitana, Mexico City (Mexico). Unidad Azcapotzalco. 1993. 157p. (In Spanish). Order Number DE94604534. Source: OSTI; NTIS (US Sales Only); INIS.

Experimental results on temperature and heat flow in a set of three vertical cylinders with internal generation of heat, water submerged and in free convection are presented in this work . Temperature distribution, Nusselt number and convective coefficient (h) for each rod, developed for the distance between the axis of cylinders in vertical position, as a consequence of the application of power in its outside, are analyzed. Experimental information about heat transfer by free convection in vertical cylinders and surfaces is analyzed. Information of the several author who have carried out studies about the heat transfer on vertical cylinders was compiled, and the proposed equations with the experimental data obtained in the thermo fluids laboratory of National Institute of Nuclear Research (ININ) were tested. The way in which separation distance, s, distribution temperature array, Nusselt number, and convective coefficient calculated for the proposed channel with the Keyhani, Dutton and experimental equations are tabulated and they are plotted for each power value and for each separation between rods. The scheme of the used equipment and the experimentation description as well as the observations of tests and graphical results are included. (Author).

1425 (NEI-DK–1281) **Equipment based on isotope techniques for the regulation of heating systems: Supplementary project.** Energiministeriets Forskninsprogram. Energianvendelse i bygninger, Energiministeriets Forskninsprogram. Energianvendelse i bygninger. Moerch, E. FORCE Insts., Copenhagen (Denmark). Jul 1993. 26p. (In Danish). Contract EM-1213/87-2;Contract EM-1213-702-06-01. Order Number DE94605805. Source: OSTI; NTIS; INIS.

EFP.87.

Flexible and user-friendly equipment has been developed for the measurement of the water flow in heating-system pipes with the help of radioactive tracer elements. The equipment comprises an injection unit, detectors and computer-based registration of data with software for data management. The equipment and method was performance tested and compared with other measuring systems. Safety measures connected with the use of radioactive tracer elements were also evaluated. It was shown that the method could determine the water flow velocity with 1-2% accuracy and the volume flow with plus/minus 10% accuracy in connection with the regulation of the water flow. The injection of the trace element can take place through the existing drain valves and measurement can be undertaken with the detector outside of the pipe insulation. Only one injection is needed to measure the flow. Both the hardware and the software function satisfactorily. Regarding the safety measures, these are easy to follow both for the trained operator and for other persons in the vicinity. The equipment is therefore ready for utilization. (AB).

1426 (NUTEK-VK–93-15) **Calculation of the transonic three-dimensional flow within a fan operating under off-design conditions.** Saeterskog, M. (Chalmers Univ. of Technology, Gothenburg (Sweden). Dept. of Thermo and Fluid Dynamics). Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 1993. 43p. Project NUTEK-566-020. Order Number DE94709785. Source: OSTI; NTIS.

A computer program for three-dimensional, viscous, transonic flow has been used to investigate the flow within an aircraft engine fan that has shown sensitivity to flutter. The flow field has been calculated under four different operating conditions. The principal aim was to find flow characteristics, in a steady flow, that can be of major importance for the onset of flutter. The calculations indicate a risk of stalled blades, near the tip, for those cases with large pressure ratios. In the fan this could result, for example, in rotating stall. Since the program used in this work cannot handle separated flow accurately, it is possible to make only qualitative judgements. Another program, solving the inviscid flow field, have also been used for comparison with the viscous solver for one operating case. The programs gave somewhat different results in the transonic flow region, resulting in spanwise variations of the flow parameters. The work has also made clear the necessity of using accurate boundary values. The use of through-flow calculations to estimate boundary values for the cascade calculations, may introduce errors that make the results questionable. 17 refs, 32 figs, 4 tabs.

1427 (UCRL-JC–112596) **A finite element formulation and adaptive solution approach for large-scale thermomechanical**

problems with complex contact conditions. Engelmann, B.E.; Whirley, R.G.; Raboin, P.J. Lawrence Livermore National Lab., CA (United States). 31 Mar 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930785–3: 8. international conference on numerical methods in laminar and turbulent flow, Swansea (United Kingdom), 18-23 Jul 1993). Order Number DE93019605. Source: OSTI; NTIS; GPO Dep.

Traditional thermal stress analysis is based on an uncoupled approach in which the thermal problem is solved on a fixed geometry, and the resulting temperatures are then used to load a mechanical problem. In contrast, a fully coupled thermomechanical analysis solves the thermal problem on the deforming geometry and incorporates thermal loads into the mechanical problem. Thermal contact, in which heat flow paths depend on the mechanical deformations of adjacent surfaces, is a major component of many fully coupled thermomechanical analyses. This paper describes the development of a Lagrangian finite element thermomechanical contact methodology. The paper focuses on the formulation and implementation of thermal contact in two dimensions. The proposed approach accommodates arbitrarily large relative motions of contact surfaces, fully unstructured meshes, pressure-dependent contact resistance, conduction across small gaps, and approximate models for convection and radiation. The proposed thermal contact formulation has been implemented in the Lawrence Livermore National Laboratory public code PALM2D and has been used to solve a diverse set of thermomechanical problems. Examples frustrating the performance of this code on large deformation thermomechanical problems are presented and discussed.

1428 (UCRL-JC–114331) **Freeze-out and the failure of Richtmyer's prescription.** Mikaelian, K.O. Lawrence Livermore National Lab., CA (United States). 23 Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303126–10: 4. international workshop on the physics of compressible turbulent mixing, Cambridge (United Kingdom), 29 Mar - 1 apr 1993). Order Number DE93041347. Source: OSTI; NTIS; GPO Dep.

In the standard Richtmyer-Meshkov instability, perturbations at a shocked interface grow after the passage of a shock. Freeze-out refers to the phenomenon whereby the perturbations do not grow, i.e., freeze-out, after the passage of a shock. This is fairly straightforward, at least theoretically (no experiments have been done so far) in a doubly shocked system. The first shock induces a growth which can be completely neutralized by a second shock, provided that the direction and the strength and timing of the second shock are properly chosen. This type of double-shock freeze-out occurs in compressible as well as incompressible fluids, and is easy to understand. Somewhat more subtle is single-shock freeze-out; in the pursuit of this phenomenon, the author found that in certain cases Richtmyer's prescription fails to give the correct growth rate.

1429 (WAPD-T–2984) **Flow and heat transfer in vertical annuli.** Ulke, A.; Goldberg, I. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-930601–33: American Nuclear Society (ANS) annual meeting, San Diego, CA (United States), 20-24 Jun 1993). Order Number DE94002345. Source: OSTI; NTIS; INIS; GPO Dep.

In shell-side boiling heat exchangers narrow crevices that are formed between the tubes and the tube support structure provide areas for local conditions which differ significantly from the bulk fluid conditions. A quasi-two-dimensional model which was developed to describe the local phenomena in a vertical, cylindrical crevice was described previously. The present work compares experimentally obtained flow and tube temperature distributions to those predicted by the model. The results confirm the characteristic "W" shape of the tube temperature profile centered at the line contact between a heated tube and tube support.

1430 (Y/MA–7206) **Improving the performance of the Y-12 fluidized bed contactors: Final report on investigations at the University of Tennessee.** Daw, C.S. (Oak Ridge National Lab., TN (United States)); Hawk, J.A. Oak Ridge Y-12 Plant, TN (United States). Aug 1993. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94000688. Source: OSTI; NTIS; GPO Dep.

Recent tests at The University of Tennessee in Knoxville (UT) have demonstrated improved fluidization performance in a mockup of the Oak Ridge Y-12 Plant fluidized bed with a modified gas distributor. Combining the modified distributor with the recently developed fluidization intensity module is expected to result in substantial operational improvements for the fluidized beds in Building 9212 at Y-12. Important additional benefits coming from the improved operation of the Y-12 fluidized beds will be a reduction in the consumption of reactant gases, a reduction in scrubber waste production, and a reduced need for manual cleaning of the particulate removal system. UT tests have also demonstrated that the tapered wall design traditionally used for the Y-12 fluidized beds does not provide a sufficient improvement in fluidization quality to justify the continued use of this design in place of a more conventional straight-wall configuration. The straight-wall design for replacement beds is expected to result in substantial equipment cost savings. Other operating scenarios that could potentially be used to reduce reactant gas consumption and scrubber waste production have also been considered. These scenarios are documented here for future reference.

4205 Materials Testing

Refer also to citation(s) 710, 1002, 1012, 1070, 1114, 1372, 1788, 1849, 1868, 2315, 2584

1431 (BARC–1993/E/014) **Non-destructive characterization techniques for rapid optical and structural analysis of dielectric thin films.** Sahoo, N.K. (Bhabha Atomic Research Centre, Bombay (India). Laser and Plasma Technology Div.); Apparao, K.V.S.R. Bhabha Atomic Research Centre, Bombay (India). 1993. 51p. Order Number DE94604564. Source: OSTI; NTIS (US Sales Only); INIS.

Dielectric optical materials play a key role in developing thin film devices for high power laser applications. But the most serious aspect of these materials is that their thin film properties differs to a large extent from the bulk properties and this poses a great challenge to the design and developmental tasks. In order to cope up with the challenge it is essential to extract all optical and structural information of these materials in thin film form using suitable characterization techniques. Although a great number of conventional diagnostic techniques are available, their application to these submicron films are rather difficult. For the present application, a number of simplified non-destructive characterization techniques to characterize dielectric materials in thin film form, both for their optical constants as well as their crystalline structure have been developed. These techniques include, spectrophotometric method, direct and indirect band gap analysis methods and interference enhanced Raman spectroscopy. Also various computational techniques are developed to make these tasks more rapid and versatile. Such techniques have been successfully applied to some of the widely used optical materials like TiO_2, SiO_2 and ZrO_2. This report presents various interesting theoretical as well as experimental aspects of such techniques. Some of the useful experimental results regarding their optical and structural properties are also presented in this report. (author). refs., figs., tabs.

1432 (IGC–128) **Biennial activity report of the Division for PIE and NDT Development [for years] 1989-1990.** Babu Rao, C.; Shyamsunder, M.T.; Murugan, S.; Ramabathiran, A.; Rajagopalan, C.; Bhattacharya, D.K.; Kumar, P.V.; Kalyanasundaram, P.; Kasiviswanathan, K.V. (eds.). Indira Gandhi Centre for Atomic Research, Kalpakkam (India). 1992. 152p. Order Number DE94605857. Source: OSTI; NTIS (US Sales Only); INIS.

This is the first biennial report of the Division for Post-Irradiation Examination and Non-Destructive Testing (DPEND) of the Indira Gandhi Centre for Atomic Research, Kalpakkam. It covers the research and development (R and D) activities of the Division during 1989 and 1990. The R and D activities of the Division are both multidisciplinary and interdisciplinary. The principal areas of R and D of DPEND are post-irradiation examination of fuel and structural materials, irradiation experiments, non-destructive evaluation for

material characterisation, quality assurance and inservice inspection, failure investigations, remote technology etc. These R and D activities are reported in the form of extended summaries arranged under the headings: research and development in non-destructive evaluation, material characterisation, instrumentation, development of techniques, software development, mechanical equipment and systems (development and commissioning), inspections, and failure analysis. Some of the highlights of these activities are : (1)setting up of a radio metallurgy laboratory with hot cells with recirculating nitrogen gas environment to facilitate post-irradiation examination of the carbide fuel of the Fast Breeder Test Reactor. (FBTR), (2) development of the remote milling and drilling machine and development of pressurised capsules for irradiation creep measurement experiments in FBTR, (b) fabrication of non-destructive testing (NDT) reference standards with controlled defects for use in Nuclear Fuel Complex, Hyderabad. There are a number of appendices listing publications, conference paper, invited talks, internal reports etc. by the scientists of the Division and also awards/prizes won by the scientists. A staff-chart of the Division is also given. (M.G.B.).

1433 (IS-M–772) **Development of small punch testing technique and its application to evaluation of mechanical properties degradation.** Kameda, J. Iowa State Univ. of Science and Technology, Ames, IA (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-931009–5: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE94001193. Source: OSTI; NTIS; GPO Dep.

The present paper summarizes a small punch (SP) testing technique developed and its application to mechanical properties characterization. It has been clearly shown on ferritic alloys that the SP test was evaluate the intergranular embrittling potency of segregated solute, such as P, Sn and Sb causing temper embrittlement, and the effects of neutron irradiation and post-irradiation annealing, giving rise to changes in the hardness and intergranular solute segregation, on the fracture properties in terms of the ductile-brittle transition temperature (DBTT). A linear relation of the DBTT determined by the SP test to that by Charpy V-notched tests has been theoretically and experimentally established. In Al alloy substrates coated with amorphous and overlaying ceramics, moreover, the global and local fracture properties were well characterized by the SP test together with acoustic emission techniques.

1434 (KCP–613-5230) **Hazardous material replacement: Final report.** Guttridge, A.H. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001361. Source: OSTI; NTIS; INIS; GPO Dep.

Methyl dianiline (MDA) is one of the components used in potting of electronic assemblies at Allied Signal Inc., Kansas City Division (KCD). MDA is a liver toxin and a suspected carcinogen. The KCD has made a commitment to eliminate the use of hazardous materials as much as technically feasible. This project was initiated to find alternatives to the MDA foam system. The project plan was to verify that the new materials developed by expert groups within the DOE nuclear weapons complex, such as the Organic Materials Group, would meet the unique requirements of the assemblies fabricated in the Electronic Products Manufacturing Building (EPMB) at KCD. The work was discontinued when associates assigned to the project were transferred to higher priority projects.

1435 (LA-UR–93-3433) **Comparison of measured and predicted plough geometries and forces for a diamond pyramidal indentor ploughing a gold surface.** Day, R.D. (Los Alamos National Lab., NM (United States)); Russell, P.; Azarkhin, A. Los Alamos National Lab., NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311102–4: American Society for Precision Engineering (ASPE) conference, Seattle, WA (United States), 7-12 Nov 1993). Order Number DE94000706. Source: OSTI; NTIS; GPO Dep.

It has been demonstrated that by adjusting the tunneling current and bias voltage parameters an STM coupled to an electronic balance can be used to perform useful ploughing experiments at nanometer scale dimensions. The ploughs produces showed evidence of instabilities the exact origin of which are not known at this time. These instabilities made comparison to a plasticity analysis more difficult but, by using a average values, both the experimentally measured vertical force and the plough's geometry were shown to be in reasonable agreement with the predictions.

1436 (SAND–92-7347) **Hydrogen generation by metal corrosion in simulated Waste Isolation Pilot Plant environments: Progress report for the period November 1989 through December 1992.** Telander, M.R. (Pacific Northwest Lab., Richland, WA (United States)); Westerman, R.E. Sandia National Labs., Albuquerque, NM (United States); Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001556. Source: OSTI; NTIS; INIS; GPO Dep.

The corrosion and gas-generation characteristics of three material types: low-carbon steel (the current waste packaging material for the Waste Isolation Pilot Plant), Cu-base materials, and Ti-base materials were determined in both the liquid and vapor phase of Brine A, a brine representative of an intergranular Salado Formation brine. Test environments included anoxic brine and anoxic brine with overpressures of CO_2, H_2S, and H_2. Low-carbon steel reacted at a slow, measurable rate with anoxic brine, liberating H_2 on an equimolar basis with Fe reacted. Presence of CO_2 caused the initial reaction to proceed more rapidly, but CO_2-induced passivation stopped the reaction if the CO_2 were present in sufficient quantities. Low-carbon steel immersed in brine with H_2S showed no reaction, apparently because of passivation of the steel by formation of a protective iron sulfide reaction product. Cu- and Ti-base materials showed essentially no corrosion when exposed to brine and overpressures of N_2, CO_2, and H_2S except for the rapid and complete reaction between Cu-base materials and H_2S. No significant reaction took place on any material in any environment in the vapor-phase exposures.

1437 (SAND–93-2213C) **Scaling issues associated with thermal and structural modeling and testing.** Thomas, R.K.; Moya, J.L.; Skocypec, R.D. Sandia National Labs., Albuquerque, NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309215–4: Surety technology symposium, Chelyacinsk (Russian Federation), 28 Sep - 2 oct 1993). Order Number DE94000555. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories (SNL) is actively engaged in research to characterize abnormal environments, and to improve our capability to accurately predict the response of engineered systems to thermal and structural events. Abnormal environments, such as impact and fire, are complex and highly nonlinear phenomena which are difficult to model by computer simulation. Validation of computer results with full scale, high fidelity test data is required. The number of possible abnormal environments and the range of initial conditions are very large. Because full-scale tests are very costly, only a minimal number have been conducted. Scale model tests are often performed to span the range of abnormal environments and initial conditions unobtainable by full-scale testing. This paper will discuss testing capabilities at SNL, issues associated with thermal and structural scaling, and issues associated with extrapolating scale model data to full-scale system response. Situated a few minutes from Albuquerque, New Mexico, are the unique test facilities of Sandia National Laboratories. The testing complex is comprised of over 40 facilities which occupy over 40 square miles. Many of the facilities have been designed and built by SNL to simulate complex problems encountered in engineering analysis and design. The facilities can provide response measurements, under closely controlled conditions, to both verify mathematical models of engineered systems and satisfy design specifications.

4210 Combustion Systems

Refer also to citation(s) 161

1438 (CONF-740807–1) **Incineration process fire and explosion protection.** Ziegler, D.L. Dow Chemical Co., Golden, CO (United States). Rocky Flats Div. 16 Sep 1975. 13p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–584). From 13. air cleaning conference; San Francisco, CA (United States); 12-15 Aug 1974. Order Number DE93019316. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Two incinerators will be installed in the plutonium recovery facility under construction at the Rocky Flats Plant. The fire and explosion protection features designed into the incineration facility are discussed as well as the nuclear safety and radioactive material containment features. Even though the incinerator system will be tied into an emergency power generation system, a potential hazard is associated with a 60-second delay in obtaining emergency power from a gas turbine driven generator. This hazard is eliminated by the use of steam jet ejectors to provide normal gas flow through the incinerator system during the 60-second power interruption.

4220 Mining and Underground Engineering

Refer also to citation(s) 669

4230 Marine Engineering

Refer also to citation(s) 669, 2105

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 753, 788, 1107, 1136, 1143, 1151, 1827, 1837, 1862, 1863, 1961, 2545, 2547, 2569, 2588, 2797, 2883

1439 (DOE/OR/00033–T534) **Investigation of a 140 GHz gryo-backward wave oscillator and a 95 GHz gyro-traveling wave.** Basten, M.A. (Massachusetts Inst. of Tech., Cambridge, MA (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States). 1 Sep 1992. 89p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000828. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Massachusetts Institute of Technology, Cambridge, MA.

There is current interest in developing a high-power source of continuously tunable millimeter wave radiation as a RF driver for high-power gyrotron, CARM, or FEL amplifiers. The gyrotron backward wave oscillator is a voltage-tunable fast-wave device that can satisfy these requirements. This thesis reports on the design and experimental investigation of a 130–145 GHz gyrotron backward wave oscillator Novel operating features of this design include the use of a 80-kV, 6.2-A Pierce-wiggler electron beam source, a broadband motheye window and an overmoded $TE_{1,2}$ cylindrical interaction waveguide. Although this device has demonstrated voltage-tunable operation over the design range in the $TE_{1,2}$ mode, the frequency tuning is not continuous, output powers were low and full-beam transmission through the interaction region was not possible. Simulations indicate that the beam has very high velocity spread induced by space charge forces in the compression region. After increasing the diameter of the beam tunnel to achieve full transmission, the $TE_{1,2}$ was not found. It is felt that the scraping off of the beam edge in the initial experiments allowed a better quality beam to enter the interaction region and inhibited coupling into competing forward wave modes. The need for radar systems with greater resolution has led to renewed interest in the development of efficient high-power amplifiers at 95 GHz. Current sources are limited to 6–8 kW of output power due to ohmic loading on the slow-wave circuit. A gyrotron traveling wave tube amplifier is capable of efficient operation over a wide bandwidth with the added attraction of low ohmic loading on the smooth fast-wave circuit. This thesis reports of the design a 95-GHz gyrotron traveling wave tube amplifier that is capable of high power (125 kW), high gain (38 dB), large bandwidth > 5 GHz and high efficiencies (> 30%).

1440 (ENEA-RT-INN–92-39) **Free electron laser gain dependence on electron-beam Twiss-parameters.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Mezi, L. Feb 1993. 15p. (RT/INN–92-39). Order Number DE94716542. Source: OSTI; NTIS (US Sales Only).

This paper shows the dependence of the FEL gain on the transverse phase-space electron-beam distribution. In particular, it is analysed the analytical dependence of the gain formula on the Twiss parameters of the electron-beam and is showed that deviations from the matching condition may severely reduce the gain in the exponential regime.

1441 (ENEA-RT-INN–92-46) **Spectral properties of two-harmonic undulator radiation.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Voykov, G. Feb 1993. 32p. (RT/INN–92-46). Order Number DE94716525. Source: OSTI; NTIS (US Sales Only).

This paper studies the spectroscopic details of the radiation emitted by electrons propagating at relativistic velocities in undulators, whose on axis field consists of the usual periodic term plus a contribution at a given harmonic. This analytic study shows that the undulator brightness can be written in a closed form using a new class of Bessel functions, which allows a clear understanding of the harmonic selection mechanisms pattern. The analytic results are compared with a fully numerical procedure and prove the equivalence of the two methods and is shown the relevance of the obtained results within the context of FEL physics.

1442 (LA-SUB–93-282) **Chemical reactions of excited nitrogen atoms for short wavelength chemical lasers: Final technical report.** Los Alamos National Lab., NM (United States); Hercules, Inc., Magna, UT (United States). Bacchus Works. 15 Dec 1989. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040560. Source: OSTI; NTIS; GPO Dep.

Accomplishments of this program include the following: (1) Scalable, chemical generation of oxygen atoms by reaction of fluorine atoms and water vapor. (2) Production of nitrogen atom densities of 1×10^{15} cm^{-3} with 5% electrical efficiency by injecting trace amounts of fluorine into microwave discharged nitrogen. (3) Production of cyanide radicals by reaction of high densities of N atoms with cyanogen. (4) Production of carbon atoms by reaction of nitrogen atoms with cyanogen or with fluorine atoms and hydrogen cyanide. (5) Confirmation that the reaction of carbon atoms and carbonyl sulfide produces $CS(a^3\ \Pi_r)$, as predicted by conservation of electron spin and orbital angular momenta and as proposed by others under another SWCL program. (6) Production of cyanide radicals by injection of cyanogen halides into active nitrogen and use as spectroscopic calibration source. (7) Demonstration that sodium atoms react with cyanogen chloride, bromide and iodide and with cyanuric trifluoride to produce cyanide radicals. (8) Demonstration of the potential utility of the fluorine atom plus ammonia reaction system in the production of $NF(b^1\Sigma^+)$ via $N(^2D) + F_2$.

1443 (LA-SUB–93-292) **Grazing incidence absorption measurements: Final report.** Los Alamos National Lab., NM (United States); Spectra Technology, Inc., Bellevue, WA (United States). 31 Jul 1989. 14p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001472. Source: OSTI; NTIS; GPO Dep.

This final report summarizes the results of a series of different measurements to characterize various mirrors of interest to Los Alamos National Laboratory and the Boeing Aerospace free electron laser program. Most of the measurements were of the glancing incidence characteristics of different overcoated silver mirrors. These included the absolute absorptance as a function of angle of incidence (0–88°), laser wavelength (0.5145 and 1.06 μm), polarization, and exposure to room air. The latter measurement examined the ability of the overcoated silver mirrors to resist tarnishing. Overcoating materials used were single-layer ThF_4 and MgF_2, a very thin layer of Al_2O_3, and diamond. As a result of the work performed during this program, significant progress has been made to find a better alternative to bare silver mirrors for high-power laser applications. Thick dielectric overcoats do protect the silver mirrors from tarnishing, but problems associated with accurately controlling the optical constants of the dielectric during the coating process appear to make it difficult to achieve the desired optical properties of the mirrors at high angles of incidence.

1444 (LA-UR–93-3237) **Variable-field permanent magnet dipole.** Barlow, D.B.; Kraus, R.H. Jr.; Meyer, R.E. Los Alamos National Lab., NM (United States). 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–5: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000800. Source: OSTI; NTIS; GPO Dep.

A new concept for a variable-field permanent-magnet dipole (VFPMD) has been designed, fabricated, and tested at Los Alamos. The VFPMD is a C-shaped sector magnet with iron poles separated by a large block of magnet material (SmCo). The central field can be continuously varied from 0.07 T to 0.3 T by moving an iron shunt closer or further away from the back of the magnet. The shunt is specially shaped to make the dependence of the dipole field strength on the shunt position as linear as possible. The dipole has a 2.8 cm high by 8 cm wide aperture with ~10 cm long poles.

1445 (LBL–34015) **Generation of harmonic radiation using the multi-cavity free-electron laser.** Krishnagopal, S. (Centre for Advanced Technology, Indore (India)); Sessler, A.M. Lawrence Berkeley Lab., CA (United States). 18 Aug 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930855–7: 15. international free electron laser conference, The Hague (Netherlands), 23-27 Aug 1993). Order Number DE94001261. Source: OSTI; NTIS; INIS; GPO Dep.

An FEL provides a convenient method of reaching short wavelengths by resonating with an input source at the fundamental wavelength while providing bunching at a harmonic of the fundamental. Recently schemes have been proposed that use two wiggler segments, one resonant at the fundamental to pre-bunch the beam, the other lasing at the desired (third) harmonic. A similar effect, with some advantages and some disadvantages, can be achieved using the Multi-Cavity FEL (MC/FEL). The MC/FEL employs several short cavities, operating in an oscillator-like manner, to achieve high output power. In this paper we consider the use of the MC/FEL as a means of generating harmonics. We investigate the competitiveness of this option in comparison with other harmonic generation schemes, in terms of the total wiggler length needed, the saturated power achieved, and the restrictions imposed by mirror reflectivity.

1446 (SAND–91-1818) **Characteristics and development report for the MC4169 double-layer capacitor assembly.** Clark, N.H.; Baca, W.E. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001730. Source: OSTI; NTIS; GPO Dep.

The MC4169 Double-Layer Capacitor Assembly was developed in response to a request from the B61 Systems organization to provide interim power for the B61 Common JTA Development. The project has been successfully completed, and Lot 1 has been built by MMSC/GEND. Development testing showed that this assembly met all design requirements. This report describes the design configuration, environmental testing, and aging, reliability, and safety studies done to ensure that the design requirements were met.

1447 (SAND–93-0337C) **Anomalous dispersion enhanced Cerenkov phase-matching.** Kowalczyk, T.C. (Case Western Reserve Univ., Cleveland, OH (United States). Dept. of Physics); Singer, K.D.; Cahill, P.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-930722–49: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94002036. Source: OSTI; NTIS; GPO Dep.

The authors report on a scheme for phase-matching second harmonic generation in polymer waveguides based on the use of anomalous dispersion to optimize Cerenkov phase matching. They have used the theoretical results of Hashizume et al. and Onda and Ito to design an optimum structure for phase-matched conversion. They have found that the use of anomalous dispersion in the design results in a 100-fold enhancement in the calculated conversion efficiency. This technique also overcomes the limitation of anomalous dispersion phase-matching which results from absorption at the second harmonic. Experiments are in progress to demonstrate these results.

1448 (SAND–93-0816C) **Micromachined actuator and sensor capabilities at the Microelectronics Development Laboratory.** Sniegowski, J.J.; Blain, M.G.; Fleming, J.G.; Garcia, E.J.; Koehler, D.R.; Smith, B.K.; Smith, J.H. Sandia National Labs., Albuquerque, NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9311101–1: GOMAC 93: government microcircuit application conference, New Orleans, LA (United States), 1-4 Nov 1993). Order Number DE93019417. Source: OSTI; NTIS; GPO Dep.

This paper briefly summarizes micromachined actuator and sensor capabilities at the Microelectronics Development Laboratory (MDL) of Sandia National Laboratories. These include efforts utilizing either bulk or surface micromachining with silicon substrates. On going developmental projects utilizing both surface and bulk micromachining along with the MDL's effort to integrate a baseline CMOS process with micromachined elements are presented. The paper is broadly divided into three major headings: Surface Micromachined Projects, Bulk Micromachined Projects, and the CMOS/Micromachining Integration Project.

1449 (SAND–93-1127C) **Electrochemical sulfur passivation of visible (~670nm) AlGaInP lasers.** Howard, A.J.; Ashby, C.I.H.; Lott, J.A.; Schneider, R.P.; Corless, R.F. Sandia National Labs., Albuquerque, NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9311104–6: 40. national symposium of the American Vacuum Society (AVS), Orlando, FL (United States), 15-19 Nov 1993). Order Number DE94002293. Source: OSTI; NTIS; GPO Dep.

III-V based devices such as FETs, HBTs and lasers often have surface leakage and thermal degradation problems due to surface states which pin the Fermi level to the mid-gap. Sulfur based passivation processes are known to improve device performance by altering surface-controlled anodic sulfur passivation scheme using Na_2S dissolved in ethylene glycol. Their process has repeatedly produced a ~25% improvement in peak output power near the catastrophic damage limit in visible (λ = 670 nm) AlGaInP edge-emitting lasers. The threshold current density and electrical characteristics were unchanged after catastrophic failure indicating that passivation raises the threshold for facet damage.

1450 (SAND–93-1626C) **Toward low-cost display assembly and packaging: Precompetitive challenges.** Palmer, D.W. (Sandia National Labs., Albuquerque, NM (United States)); Lin, G.K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931192–1: International Society for Hybrid Microcircuits (ISHM) annual meeting, Dallas, TX (United States), Nov 1993). Order Number DE93018850. Source: OSTI; NTIS; GPO Dep.

Short communication. DISPLAY DEVICES/packaging; INTEGRATED CIRCUITS/packaging; PACKAGING; PROCESS CONTROL; CONTAMINATION; BONDING; SEALS; RELIABILITY; FABRICATION

1451 (SAND–93-1750C) **Sensors for process control Focus Team report.** Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9307140–1: Contamination free manufacturing focus technical advisory board meeting, Austin, TX (United States), 14-15 Jul 1993). Order Number DE93040897. Source: OSTI; NTIS; GPO Dep.

At the Semiconductor Technology Workshop, held in November 1992, the Semiconductor Industry Association (SIA) convened 179 semiconductor technology experts to assess the 15-year outlook for the semiconductor manufacturing industry. The output of the Workshop, a document entitled "Semiconductor Technology: Workshop Working Group Reports," contained an overall roadmap for the technology characteristics envisioned in integrated circuits (ICs)

for the period 1992–2007. In addition, the document contained individual roadmaps for numerous key areas in IC manufacturing, such as film deposition, thermal processing, manufacturing systems, exposure technology, etc. The SIA Report did not contain a separate roadmap for contamination free manufacturing (CFM). A key component of CFM for the next 15 years is the use of sensors for (1) defect reduction, (2) improved product quality, (3) improved yield, (4) improved tool utilization through contamination reduction, and (5) real time process control in semiconductor fabrication. The objective of this Focus Team is to generate a Sensors for Process Control Roadmap. Implicit in this objective is the identification of gaps in current sensor technology so that research and development activity in the sensor industry can be stimulated to develop sensor systems capable of meeting the projected roadmap needs. Sensor performance features of interest include detection limit, specificity, sensitivity, ease of installation and maintenance, range, response time, accuracy, precision, ease and frequency of calibration, degree of automation, and adaptability to in-line process control applications.

1452 (SAND–93-1874C) **Fluorescent microthermographic imaging.** Barton, D.L. Sandia National Labs., Albuquerque, NM (United States). 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931191–3: 1993 international symposium on testing and failure analysis, Los Angeles, CA (United States), 15-19 Nov 1993). Order Number DE93040332. Source: OSTI; NTIS; GPO Dep.

In the early days of microelectronics, design rules and feature sizes were large enough that sub-micron spatial resolution was not needed. Infrared or IR thermal techniques were available that calculated the object's temperature from infrared emission. There is a fundamental spatial resolution limitation dependent on the wavelengths of light being used in the image formation process. As the integrated circuit feature sizes began to shrink toward the one micron level, the limitations imposed on IR thermal systems became more pronounced. Something else was needed to overcome this limitation. Liquid crystals have been used with great success, but they lack the temperature measurement capabilities of other techniques. The fluorescent microthermographic imaging technique (FMI) was developed to meet this need. This technique offers better than 0.01°C temperature resolution and is diffraction limited to 0.3 μm spatial resolution. While the temperature resolution is comparable to that available on IR systems, the spatial resolution is much better. The FMI technique provides better spatial resolution by using a temperature dependent fluorescent film that emits light at 612 nm instead of the 1.5 μm to 12 μm range used by IR techniques. This tutorial starts with a review of blackbody radiation physics, the process by which all heated objects emit radiation to their surroundings, in order to understand the sources of information that are available to characterize an object's surface temperature. The processes used in infrared thermal imaging are then detailed to point out the limitations of the technique but also to contrast it with the FMI process. The FMI technique is then described in detail, starting with the fluorescent film physics and ending with a series of examples of past applications of FMI.

1453 (SAND–93-1981C) **Particle behavior in an ECR plasma etch tool.** Blain, M.G. (Sandia National Labs., Albuquerque, NM (United States)); Tipton, G.D.; Holber, W.M.; Westerfield, P.L.; Maxwell, K.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308151–1: North Atlantic Treaty Organization (NATO) advanced research workshop, Toulouse (France), 30 Aug - 3 sep 1993). Order Number DE93040343. Source: OSTI; NTIS; INIS; GPO Dep.

Sources of particles in a close-coupled electron cyclotron resonance (ECR) polysilicon plasma etch source include flaking of films deposited on chamber surfaces, and shedding of material from electrostatic wafer chucks. A large, episodic increase in the number of particles added to a wafer in a clean system is observed more frequently for a plasma-on than for a gas-only source condition. For polymer forming process conditions, particles were added to wafers by a polymer film which was observed to fracture and flake away from chamber surfaces. The presence of a plasma, especially when rf bias is applied to the wafer, caused more particles to be ejected from the walls and added to wafers than the gas-only condition; however, no significant influence was observed with different microwave powers. A study of effect of electrode temperatures on particles added showed that thermophoretic forces are not significant for this ECR configuration. Particles originating from the electrostatic chuck were observed to be deposited on wafers in much larger numbers in the presence of the plasma as compared to gas-only conditions.

1454 (UCRL-JC–110367) **A novel process monitoring and control system based on a neural manufacturing concept.** Fu, Chi Yung; Petrich, L.; Law, B. Lawrence Livermore National Lab., CA (United States). 14 Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-921188–2: Government microcircuit applications conference: microelectronics in the new world order, Las Vegas, NV (United States), 9-12 Nov 1992). Order Number DE94001516. Source: OSTI; NTIS; GPO Dep.

This paper describes our work to produce "smart" equipment using a neural network to provide intelligence for process monitoring, adaptive control, metrology, and equipment diagnostics. This novel system will improve both quality and yield for critical thin films used in semiconductors, superconductors, high-density magnetic and optical storage, and advanced displays, all of which are critical to maintaining our leadership in the multibillion-dollar electronic and computer industries. The equipment will have on-line, real-time diagnostics capabilities to detect component problems early in order to minimize maintenance and downtime.

1455 (UCRL-JC–112023) **High power, electron-beam induced switching in diamond.** Scarpetti, R.D. (Lawrence Livermore National Lab., CA (United States)); Hofer, W.W.; Kania, D.R.; Schoenbach, K.H.; Joshi, R.P.; Molina, C.; Brinkmann, R.P. Lawrence Livermore National Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930616–37: 9. IEEE pulsed power conference, Albuquerque, NM (United States), 21-23 Jun 1993). Order Number DE93040535. Source: OSTI; NTIS; GPO Dep.

We are developing a high voltage, high average power, electron-beam controlled diamond switch that could significantly impact high power solid-state electronics in industrial and defense applications. An electron-beam controlled thin-film diamond could switch well over 100 kW average power at MHz frequencies, greater than 5 kV, and with high efficiency. This performance is due to the excellent thermal and electronic properties of diamond, the high efficiency achieved with electron beam control, and the demonstrated effectiveness of microchannel cooling. Our electron beam penetration depth measurements agree with our Monte-Carlo calculations. We have not observed electron beam damage in diamond for beam energies up to 150 keV. In this paper we describe our experimental and calculational results and research objectives.

1456 (UCRL-JC–112339) **Picosecond High Pressure Gas Switch experiment.** Cravey, W.R.; Freytag, E.K.; Goerz, D.A.; Poulsen, P.; Pincosy, P.A. Lawrence Livermore National Lab., CA (United States). Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930616–39: 9. IEEE pulsed power conference, Albuquerque, NM (United States), 21-23 Jun 1993). Order Number DE93040853. Source: OSTI; NTIS; GPO Dep.

A high Pressure Gas Switch has been developed and tested at LLNL. Risetimes on the order of 200 picoseconds have been observed at 1 kHz prf and 1 atmosphere pressures. Calculations show that switching closure times on the order of tens of picoseconds can be achieved at higher pressures and electric fields. A voltage hold-off of 1 MV/cm has been measured at 10 atmospheres and several MV/cm appears possible with the HPGS. With such high electric field levels, energy storage of tens of Joules in a reasonably sized package is achievable. Initial HPGS performance has been characterized using the WASP pulse generator at LLNL. A detailed description of the switch used for initial testing is given. Switch recovery times of 1-ms have been measured at 1 atmosphere. Data on the switching uniformity, voltage hold-off recovery,

and pulse repeatability, is presented. In addition, a physics switch model is described and results are compared with experimental data. Modifications made to the WASP HV pulser in order to drive the HPGS will also be discussed. Recovery times of less than 1 ms were recorded without gas flow in the switch chambers. Low pressure synthetic air was used as the switch dielectric. Longer recovery times were required when it was necessary to over-voltage the switch.

1457 (UCRL-JC–112553) **Characterization of germanium stripe x-ray lasers.** Wan, A.S.; Moreno, J.C.; MacGowan, B.J. Lawrence Livermore National Lab., CA (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–32: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93019629. Source: OSTI; NTIS; GPO Dep.

One method of improving the transverse spatial coherence of x-ray lasers (XRLS) is by adaptive spatial filtering of XRL apertures using geometric shaping in the form of bowtie or wedge XRLS. However, we must maintain the desired geometric shapes in exploding foil or slab configurations during the lasing period. As a first step toward understanding Lasing in such geometries we study the behavior of simple stripe XRLs. Past experience with stripe XRLs deposited on thick plastic substrates resulted in significantly weaker laser intensities as compared to line-focused slab XRLs. Possible reasons for this intensity reduction of stripe XRLs could include mixing at the laser boundary, and changes in plasma, kinetics, and hydrodynamic properties which affect laser gains and propagation. We will present experimental and theoretical characterizations of germanium line-focused and stripe XRLs. Key experimental parameters we will study include images of emission profiles of the laser blow-off, angular divergences, XRL output intensities, and ionization balances as we vary XRL designs. We will compare the experimental results with two-dimensional (2-D) laser deposition and hydrodynamics simulations using LASNEX, and study the changes in ionization balances and level populations from post-processing LASNEX results.

1458 (UCRL-JC–113483) **Silicon microelectronic field-emissive devices for advanced display technology.** Morse, J.D. Lawrence Livermore National Lab., CA (United States). 29 Mar 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303198–6: National Center for Advanced Information Components Manufacturing (NCAICM) workshop, Albuquerque, NM (United States), 30-31 Mar 1993). Order Number DE94000397. Source: OSTI; NTIS; GPO Dep.

Field-emission displays (FEDS) offer potential advantages of high luminous efficiency, low power consumption, and low cost compared to AMLCD or CRT technologies. An LLNL team has developed silicon-point field emitters for vacuum triode structures and has also used thin-film processing techniques to demonstrate planar edge-emitter configurations. LLNL is interested in contributing its experience in this and other FED-related technologies to collaborations for commercial FED development. At LLNL, FED development is supported by computational capabilities in charge transport and surface/interface modeling in order to develop smaller, low-work-function field emitters using a variety of materials and coatings. Thin-film processing, microfabrication, and diagnostic/test labs permit experimental exploration of emitter and resistor structures. High field standoff technology is an area of long-standing expertise that guides development of low-cost spacers for FEDS. Vacuum sealing facilities are available to complete the FED production engineering process. Drivers constitute a significant fraction of the cost of any flat-panel display. LINL has an advanced packaging group that can provide chip-on-glass technologies and three-dimensional interconnect generation permitting driver placement on either the front or the back of the display substrate.

1459 (UCRL-JC–114003) **Fabrication of sub-40-nm p-n junctions for 0.18 μm MOS device applications using a cluster-tool-compatible, nanosecond thermal doping technique.** Weiner, K.H.; McCarthy, A.M. Lawrence Livermore National Lab., CA (United States). 20 Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309264–1: Society of Photo-Optical Instrumentation Engineers (SPIE) symposium on microelectronics procession, Monterey, CA (United States), 27-29 Sep 1993). Order Number DE94001608. Source: OSTI; NTIS; GPO Dep.

In this paper, we introduced an alternative deep-submicrometer doping technology, Projection Gas Immersion Laser Doping (P-GILD). Representing the marriage of lithography and diffusion, P-GILD is a resistless, step-and-repeat doping process that utilizes excimer laser light patterned by a dielectric reticle to selectively heat and, thereby, dope regions of an integrated circuit. Results of physical and electrical characterization are presented for ultra-shallow p^+ $-n$ and n^+ $-p$ junctions produced by gas immersion laser doping (GILD), a phenomenologically identical technique that utilizes an aluminum contact mask rather than a dielectric reticle to pattern the beam. Junctions produced using GILD exhibit uniformly-doped, abrupt impurity profiles with no apparent defect formation in the silicon. Electrically, sheet and contact resistivities of the ultra-shallow junctions are less than 100Ω/sheet and 1×10^{-6} $\Omega \cdot cm^2$, respectively, while n^+ $-p$ and p^+ $-n$ diodes exhibit nearly ideal forward bias behavior and reverse leakage current densities less than 5 nA/cm^2 at -5V. Uniformity of both diode characteristics and sheet resistance for junctions produced by the step-and-repeat process is also shown to be better than $\pm 5\%$ across a 4-inch wafer.

1460 (UCRL-JC–114074) **X-ray characterization of a three-element condenser system for soft x-ray projection lithography.** Gaines, D.P. (Brigham Young Univ., Provo, UT (United States)); Sommargren, G.E.; Vernon, S.P.; English, R.E. Lawrence Livermore National Lab., CA (United States). 16 Jun 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305159–9: Optical Society of America (OSA) topical meeting on soft x-ray projection lithography, Monterey, CA (United States), 10-12 May 1993). Order Number DE93019916. Source: OSTI; NTIS; GPO Dep.

A three-element condenser system has been fabricated and coated with multilayer reflectors designed to operate at a wavelength of 13.3 nm. The performance of the condenser system was evaluated by measuring the reflectance of the individual condenser mirrors at normal incidence and modeling the system transport efficiency. Although a transport efficiency of 17% should be attainable with this design, actual condenser performance will be reduced because of d-spacing variations on mirror C2 and surface roughness on mirror C3. Replacement mirrors C2 and C3 are being fabricated to recover system performance.

1461 (UCRL-JC–114493) **Ray and wave optics modeling of laboratory x-ray lasers.** Ratowsky, R.P. (Lawrence Livermore National Lab., CA (United States)); London, R.A.; Feit, M.D.; Walling, R.W.; Shimkaveg, G.M.; Craxton, R.S. Lawrence Livermore National Lab., CA (United States). Jun 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–34: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93019940. Source: OSTI; NTIS; GPO Dep.

Much progress has been made recently in characterizing the emission from neon-like Yttrium exploding foil x-ray lasers at Lawrence Livermore National Laboratory. Concomitant with that effort, we have carried out detailed modeling to enhance our understanding of the experiments and improve their design. Our modeling includes target hydrodynamics, calculation of gain, and both ray and wave optics propagation. We will describe our modeling of Yt x-ray lasers, including first simulations using a two transverse dimensional gain calculation. Our calculations indicate that the time-integrated signal is very sensitive to the time history of the gain, because of the rapid sweep of the beam in angle measured with respect to the plane of the foil. We have found that better agreement with experiment is achieved if the falloff of the gain with time is made slightly faster than our codes predict. In the vertical direction (normal to exploding foil direction), the experimental beam pattern is typically broader than we calculate. We find that ray and wave optics calculations are in good agreement. The coherence length obtained by a wave optics calculation is larger than seen in experiments; tills is probably due to fluctuations and/or the smooth variation of the pump laser line focus. We discuss possible

improvements to our modeling which would include such nonideal effects.

1462 (UCRL-JC–115147) **Microtechnology: The key to the technical challenges of the 21st century.** Ceglio, N.M. Lawrence Livermore National Lab., CA (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308168–2: International seminar on planetary emergencies, Erice (Italy), 19-24 Aug 1993). Order Number DE94000403. Source: OSTI; NTIS; GPO Dep.

Through the ages each culture and civilization has expressed its values and world view in the form of monuments derived from its most advanced and valued technologies. From pyramids to cathedrals, skyscrapers and moon rockets, our technology has enabled us to leave our mark on the landscape and in the minds of our people. In the 21st century, the compelling technology will be that of the micro-world, enabling the fabrication of structures with features smaller than the wavelengths of light. Such structures will allow use to monitor and control electrical, chemical, and optical phenomena in ways never before imagined. As in the past we will continue to create monuments, but the technological monuments of the 21st century will likely be viewed through a microscope. This report provides a discussion of microtechnology in the 21st century.

4270 Nuclear Explosions

1463 (SAND–93-0513C) **Cavity gas pressure measurements on DIAMOND FORTUNE.** Smith, C.W.; Breeze, S.P. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309103–2: 7. symposium on containment of underground nuclear explosions, Kent, WA (United States), 13-17 Sep 1993). Order Number DE94001202. Source: OSTI; NTIS; GPO Dep.

Five measurements were made of the gas pressure in the cavity as a function of time on the DIAMOND FORTUNE event. The measurements were obtained with a fast and slow blowdown technique; an additional transducer on the cavity side of the explosive valve provided valuable data. Data from three of the five transducers are nearly coincident data from the other two show temperature-related shifts. The timeframe of the credible measurements extends from 0.1 second to four hours. The pressure at two seconds was 2,100 kPa (300 Psi). On the logarithmic time scale this level decays monotonically to 210 kPa (30 Psi) at 1,000 seconds. During the next decade of time the cavity pressure approached atmospheric pressure. Over the initial few seconds the measured amplitude is close to the S-Cubed prediction; with increased time the measured pressure decays at a faster rate.

43 PARTICLE ACCELERATORS

Refer also to citation(s) 2298, 2417, 2482

1464 (ANL/PHY/CP–80830) **A system for managing information at ATLAS.** Tilbrook, I.R. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309262–1: 1993 symposium of North-Eastern Accelerator Personnel (SNEAP), Rochester, NY (United States), 22-25 Sep 1993). Order Number DE94001337. Source: OSTI; NTIS; INIS; GPO Dep.

In response to a need for better management of maintenance and document information at the Argonne Tandem-Linear Accelerating System (ATLAS), the ATLAS Information Management System (AIMS) has been created. The system is based on the relational database model. The system's applications use the Alpha-4 relational database management system, a commercially available software package. The system's function and design are described.

1465 (JAERI-M–93-174) **JAERI TANDEM and V.D.G. annual report 1992 April 1, 1992 - March 31, 1993.** Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 183p. Order Number DE94719028. Source: OSTI; NTIS; INIS.

This annual report describes research activities which have been performed with the JAERI tandem accelerator and the Van de Graaff accelerator from April 1, 1992 to March 31, 1993. Summary reports of 41 papers, and list of publications, personnel and cooperative researches with universities are contained. (author).

1466 (JINR-R–9-92-296) **The creation and development of new physics of acceleration.** Bonch-Osmolovskij, A.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 14p. (In Russian). Order Number DE94605817. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to At. Ehnerg.

The creation and stages of development of the new field of physics - the physics of the dense charge-particle ensembles and connected with it new principles of acceleration are considered. In brief form the explanation of the essence of the physics of new acceleration methods was given, their state and perspectives of their development were pictures. 13 refs.

1467 (SLAC-PUB–6264) **Summary of experimentation issues.** Ash, W.W. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jul 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930449–3: International workshop on physics and instrumentation at future linear colliders, Kona, HI (United States), 26-30 Apr 1993). Order Number DE93041015. Source: OSTI; NTIS; INIS; GPO Dep.

The conveners of the parallel session on Experimentation–assembled a group that well represented the spectrum of topics and the international community that is doing the work. This paper is an attempt to summarize the thirteen talks given in that session. Since the speakers often covered similar topics from different viewpoints or reflected work going on in different labs, I have borrowed from each of the contributor's presentations and rearranged them according to the list of topics. I urge the reader to study each of the papers individually to get the full picture and avoid any unintentional oversights. These are the topics: Background conditions for flat beam running at SLC; measurement of mini-jets at Tristan; fractional luminosity near the maximum energy in the presence of beamstrahlung; support tubes for JLC vertex chambers and final quadrupole magnets–design studies; interaction region studies for the NLC as pursued at SLAC; recent developments in CCDs suitable for linear collider vertex detectors; studies of vertex detector design options using simulated b events; physics benchmarks for detector choice and machine performance discussed with alternatives; experimental challenges and opportunities at linear colliders; studies on detector options in the CLIC group including IP simulation and detector options; progress report on background simulation at the NLC; Z-pole option for Japan Linear Collider; and Gismo simulation program for detector optimization.

4301 Design, Development, and Operation

Refer also to citation(s) 280, 1445, 2299, 2425, 2571, 2773

1468 (ANL/APS/IN/VIB–93/1) **Response of APS storage ring basemat to ambient vibration.** Jendrzejczyk, J.A.; Wambsganss, M.W.; Smith, R.K. Argonne National Lab., IL (United States). Advanced Photon Source Accelerator Systems Div. Aug 1992. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001428. Source: OSTI; NTIS; INIS; GPO Dep.

The storage ring of the Advanced Photon Source (APS) facility at Argonne is very sensitive to vibration. Large vibration amplitudes would result in degraded machine performance. Because the storage ring assembly is supported on the storage ring basemat, the dynamics of the basemat are critical to successful operation. Before construction began, a survey of site ground vibration indicated that the site was acceptable from a vibration standpoint. When construction of the linear accelerator (Linac) floor slab and shielding walls was completed, dynamic-response measurements were conducted. The slab/wall system showed attenuation of soilborne vibrations in the horizontal directions, but an amplification (approximately a factor of 1.5) of vertical vibration at a frequency of 7.7 Hz. Vibration response of the slab/wall system at all other frequencies

showed attenuation of soilborne vibrations. Dynamic-response measurements were also conducted on an incomplete section of the storage ring basemat. Although this section was not prototypical, results were similar to those of the Linac floor in the horizontal direction, showing large damping and attenuation of horizontal soilborne vibrations. While the basemat followed the soil vibration in the vertical direction, no large amplification was observed. However, measured vertical amplitudes on the basemat were a function of location, indicating a modal response. A series of vibration response measurements was conducted on a completed section of the storage ring basemat/tunnel adjacent and to the west of the Early Assembly Area (EAA) on May 21, 1992, and is the subject of this report.

1469 (ANL/ASD/CP–79458) **EPICS: A control system software co-development success story.** Knott, M. (Argonne National Lab., IL (United States)); Gurd, D.; Lewis, S.; Thuot, M. Argonne National Lab., IL (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931023–2: International conference on accelerator and large experimental control systems, Berlin (Germany), 18-22 Oct 1993). Order Number DE94002205. Source: OSTI; NTIS; INIS; GPO Dep.

The Experimental Physics and Industrial Control Systems (EPICS) is the result of a software sharing and co-development effort of major importance now underway. The initial two participants, LANL and ANL, have now been joined by three other labs, and an earlier version of the software has been transferred to three commercial firms and is currently undergoing separate development. The reasons for EPICS's success may be useful to enumerate and explain and the desire and prospects for its continued development are certainly worth examining.

1470 (ANL/ASD/CP–80266) **The alignment of the Advanced Photon Source at Argonne National Laboratory.** Friedsam, H. Argonne National Lab., IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309204–3: 3. international workshop on accelerator alignments, Annecy (France), 28 Sep - 1 oct 1993). Order Number DE93019758. Source: OSTI; NTIS; INIS; GPO Dep.

Currently the Advanced Photon Source (APS) is under construction at the Argonne National Laboratory. The APS is a 7-GeV synchrotron light source which will be used for basic research in material science, chemistry, physics, biology, and medicine to name a few of the participating disciplines. The commissioning phase for the APS is planned to start at the beginning of 1995. This paper describes the general parameters of the Advanced Photon Source, the required survey and alignment tolerances, and the alignment concept and instrumentation used to position storage ring beam components.

1471 (CNIC–00646) **Intelligent CAE system of CYCLONE type cyclotron main magnet and its applications.** Zhang Tianjue (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Chen Yong; Fan Mingwu. China Nuclear Information Centre, Beijing, BJ (China). Jul 1992. 9p. (IAE–0107.). Order Number DE94604543. Source: OSTI; NTIS (US Sales Only); INIS.

The main magnet that represents the feature of the cyclotron is the most important part in a cyclotron construction. Though there are many codes devoted to solve magnetic field computation problems, the results from them depend on the user's skill and experience very much. To help cyclotron magnet designer to get acceptable results, an intelligent CAE (computer aided engineering) system for CYCLONE type cyclotron magnet design and machining has been developed. A reasonable good results in the design could be got even if the designer is a beginner, because of the help from an expert knowledge library installed in the program.

1472 (CNIC–00647) **Three dimensional field computation software package DE3D and its applications.** Fan Mingwu (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Zhang Tianjue; Yan Weili. China Nuclear Information Centre, Beijing, BJ (China). Jul 1992. 12p. (IAE–0108.). Order Number DE94604544. Source: OSTI; NTIS (US Sales Only); INIS.

A software package, DE3D that can be run on PC for three dimensional electrostatic and magnetostatic field analysis has been developed in CIAE (China Institute of Atomic Energy). Two scalar potential method and special numerical techniques have made the code with high precision. It can be used for electrostatic and magnetostatic fields computations with complex boundary conditions. In the most cases, the result accuracy is better than 1% comparing with the measured. In some situations, the results are more acceptable than the other codes because some tricks are used for the current integral. Typical examples, design of a cyclotron magnet and magnetic elements on its beam transport line, given in the paper show how the program helps the designer to improve the design of the product. The software package could bring advantages to the producers and designers.

1473 (CONF-930511–485) **Use of the Holifield Facility 25-MV tandem accelerator in the Oak Ridge Radioactive Ion Beam Project.** Jones, C.M.; Juras, R.C.; Meigs, M.J.; Olsen, D.K. Oak Ridge National Lab., TN (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International particle accelerator conference; Washington, DC (United States); 17-20 May 1993. Order Number DE94000486. Source: OSTI; NTIS; INIS; GPO Dep.

The absence of time structure and the excellent beam and beam transport properties of tandem electrostatic accelerators make them an attractive choice for the acceleration of a large class of radioactive ion species produced with the ISOL technique. In this paper, considerations on the use of the Holified facility 25-MV tandem accelerator in the ORNL Radioactive Ion Beam Facility now under construction will be presented. Preliminary beam parameter measurement which suggest that the 25-MV tandem accelerator can be used as an effective separator of isobaric contaminant beams will also be presented and discussed.

1474 (CONF-931160–22) **Radiation levels in the SSC experimental facilities.** Alsmiller, F.S.; Alsmiller, R.G. Jr.; Fu, C.Y.; Gabriel, T.A.; Lillie, R.A.; Slater, C.O. Oak Ridge National Lab., TN (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94000470. Source: OSTI; NTIS; INIS; GPO Dep.

Because of the increase in beam energy and intensity at the Superconducting Super Collider Laboratory (SSCL) accelerator, the biological shielding necessary for the experimental halls as well as the shielding for various detector components will require a much more critical review than that carried out for previous high energy physics facilities such as the Fermi National Accelerator Laboratory (FNAL) or the Stanford Linear Accelerator Center (SLAC). This paper summarizes studies of the neutron and gamma-ray doses that are anticipated in and around the Solenoidal Detector Collaboration (SDC) and the Gamma Electron Muon (GEM) experimental halls, the Beam Calibration (BC) hall, and a study of shield optimization for the muon chambers. The analysis for SDC and GEM halls included normal operation and accidental conditions.

1475 (DOE/ER–0594P) **Report of the DOE Review Committee on the baseline validation of the Superconducting Super Collider.** USDOE Office of Energy Research, Washington, DC (United States). Office of Field Operations Management. Aug 1993. 284p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93040413. Source: OSTI; NTIS; GPO Dep.

The Secretary of Energy directed that an independent review of the current cost and schedule baseline for the SSC be conducted. The purpose of this independent review was to validate the current cost and schedule baseline and to ensure that the project status is accurate as currently reported. Through May 1993, approximately $1.5 billion of the baseline cost of $8.249 billion had been expended, with project completion forecasted on the baseline schedule as of September 1999. This report documents the findings of the SSC Baseline Validation Review Committee (the Committee). The report is organized into five parts. The first section is the Executive Summary. This introduction is followed by a discussion of the project progress/status as determined by the Committee. The next section describes the Committee's estimate of the cost at completion for the SSC project, followed by an assessment of the

adequacy of the business management systems currently being used to manage the project. The final section presents the Committee's conclusions and recommendations. The main body of the report is followed by the subcommittee reports and appendices.

1476 (INIS-UA–0001, pp. 35-53) **Prospect for studies with radioactive nuclear beams from the Moscow meson factory.** Il'inov, A.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Lobashev, V.M.; Vyalov, G.N.; Zhujkov, B.L. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The project of production of high-intensity radionuclide beams with the energy of more that 5 MeV/nucleon at the Moscow meson facility is considered. Some applications of radioactive nuclear beams to develop the research in nuclear physics and other branches of science are discussed.

1477 (LA-UR–93-3469) **A virtual prototype for an explosives detection system.** Seed, T.; Berman, B.L.; Zahrt, J.D. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by Department of Transportation, Washington, DC (United States); Federal Aviation Administration, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310164–5: International symposium on substance identification technologies, Innsbruck (Austria), 4-8 Oct 1993). Order Number DE94000681. Source: OSTI; NTIS; GPO Dep.

The development of the resonance-absorption based explosives detection system (EDS), as initially planned, involved the parallel development of a high-current proton accelerator (with a long development time) and the other detection subsystems. The design approach for the latter was to develop a capability for computer modeling the essential processes of each subsystem, benchmark these models by experiment, and link the models, i.e., creating a virtual prototype, to explore the effect of subsystem design changes on the EDS system performance. Additionally, when the EDS prototype system was completed, the linked models would be used to investigate further trade-offs in defining an airport system. Most of the necessary subsystem modeling was completed and used in subsystem design. Linking of all of the subsystems was accomplished to some degree or another. There are many physical and mathematical processes that take place between the acceleration of the proton beam and the final display of the reconstructed image. Figure 1 summarizes these processes and indicates which code was used to model each particular process. Section II reports on the modeling of the proton beam incident on a ^{13}C target. The gamma-ray output is the desired output from this phase of modeling. Section III describes the tools used to investigate the transport of the gamma-rays through computer simulated phantoms (suitcases). Two different codes were used in this investigation: a Monte Carlo photon transport code and a ray tracing code. One benchmark between these codes was accomplished. Section IV is concerned with the model calculations performed on single detectors. The calculations again were performed with a Monte Carlo transport code. The reconstruction code, used throughout in the simulations and as the workhorse in the analysis of the real experiments. The authors conclude, in Section VII, with the assessment of the simulation/virtual prototyping of the real experiment.

1478 (LA-UR–93-3532) **Fault-tolerant superconducting linac design for a 5-MW neutron spallation source.** Swain, G.R. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931039–2: 6. workshop on RF superconductivity, Newport News, VA (United States), 4-8 Oct 1993). Order Number DE94002631. Source: OSTI; NTIS; INIS; GPO Dep.

An 805-MHz superconducting linac is proposed which could accelerate protons from 0.1 to 2.0 GeV in less than 730 m for a peak surface field in the cavities of 17 MV/m. The linac would furnish 5 MW of beam for a neutron spallation source, plus up to 10 additional MW of beam for other purposes. The design uses 454 elliptical cavities arranged in twelve groups, identical cavities being used within each group. Characterization of elliptical cavities for betas from 0.44 to 0.94 and the steps of the design procedure are presented. The effective peak power fed by each rf coupler would be less than 100 kW for all of the cavities. 6.5 kW of power at 2 deg K would need to be extracted by the cryogenic system. Space charge was found to have a negligible effect on emittance growth. The design is such that one cavity per group could be inoperable, and the gradient in the remaining cavities could be increased to compensate. The longitudinal and transverse acceptances of the linac would not be significantly degraded under such fault conditions. A corresponding 402.5 MHz linac design is being developed.

1479 (SLAC–411) **Next Linear Collider Test Accelerator conceptual design report.** Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1993. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94002929. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the scientific justification and the conceptual design for the "Next Linear Collider Test Accelerator" (NLCTA) at SLAC. The goals of the NLCTA are to integrate the new technologies of X-band accelerator structures and rf systems being developed for the Next Linear Collider, to measure the growth of the "dark current" generated by rf field emission in the accelerator, to demonstrate multi-bunch beam-loading energy compensation and suppression of higher-order deflecting modes, and to measure any transverse components of the accelerating field. The NLCTA will be a 42-meter-long beam line consisting, consecutively, of a thermionic-cathode gun, an X-band buncher, a magnetic chicane, six 1.8-meter-long sections of 11.4-GHz accelerator structure, and a magnetic spectrometer. Initially, the unloaded accelerating gradient will be 50 MV/m. A higher-gradient upgrade option eventually would increase the unloaded gradient to 100 MV/m.

1480 (SLAC-PUB–6103) **Recent SLC developments.** Ross, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–417: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040952. Source: OSTI; NTIS; INIS; GPO Dep.

The SLAC Linear Collider (SLC) is the forerunner of a new generation of high energy accelerators. As such, it incorporates many novel features that must be fully exploited to achieve optimum performance. In this paper we present an overview of the frontiers of collider performance at SLC. Recent developments have centered on polarization, intensity and emittance preservation issues. A polarized source and spin transport system were successfully commissioned in 1992 and operated with high reliability. Practical intensity limits associated with rapid growth ($<\tau_S$) bunch length instabilities have been observed in the damping rings. Ring RF voltage manipulations are used to suppress the instabilities. Emittance preservation technique development has focused on controlling system-wide instabilities and improving feedback and tuning procedures. Control of instabilities of all time scales, pulse to pulse, fast and slow, is one of the most challenging aspects of the collider. The challenge is met with (1) very high level of control and automation required for general tuning and optimization, (2) real-time transport line optical correction and monitoring, (3) coupled, high level, trajectory and energy feedback, (4) high order multipole optical correction and monitoring, (5) feedback-based linac beam emittance preservation, and (6) interaction region luminosity optimization. The common thread beneath all of these is the SLC control system which must provide a level of control, diagnosis and feedback not required for simpler machines.

1481 (SLAC-PUB–6150) **Status of the variable momentum compaction storage ring experiment in SPEAR.** Tran, P. (California Univ., Los Angeles, CA (United States)); Amiry, A.; Pellegrini, C. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0025;LBL–34031;CONF-930511–451: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041054. Source: OSTI; NTIS; INIS; GPO Dep.

Variable momentum compaction lattices have been proposed for electron-positron colliders and synchrotron radiation sources to control synchrotron tune and bunch length. To address questions of single particle stability limits, a study has been initiated to change the SPEAR lattice into a variable momentum compaction configuration for experimental investigation of the beam dynamics. In this paper, we describe a model-based method used to transform SPEAR from the injection lattice to the low momentum compaction configuration. Experimental observations of the process are reviewed.

1482 (SLAC-PUB–6156) **CATER: An online problem tracking facility for SLC.** Sass, R.C.; Shoaee, H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–463: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041059. Source: OSTI; NTIS; INIS; GPO Dep.

An online facility has been developed for SLC to organize and simplify the management of all problems encountered in the operation of the accelerator. CATER (Computer Aided Trouble Entry and Reporting) may be used to make the initial entry of a problem, to enter one or more solutions to a problem, to modify or closeout a problem, to generate a variety of pre-defined reports giving status and statistical summaries, and to allow anyone to browse the database. All phases of CATER can take place on the operator console, workstations, or on any ANSI compatible terminal. The user interface is designed around a menu driven windowed environment with a large amount of context sensitive help information to alleviate the need for consulting user documentation. Currently, the CATER database contains information on more than 30,000 problems entered since it went online in January of 1988. The features of the software and some implementation details will be presented.

1483 (SLAC-PUB–6183) **Accelerator structure development for NLC.** Hoag, H.A. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Deruyter, H.; Pearson, C.; Ruth, R.D.; Wang, J.W.; Schaefer, J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–454: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041075. Source: OSTI; NTIS; INIS; GPO Dep.

In the program of work directed towards the development of an X-Band Next Linear Collider accelerator structure, two different test accelerator sections have been completed, and a third is being fabricated. The first is a simple 30-cell constant-impedance section in which no special attention was given to surface finish, pumping, and alignment. The second is an 86-cell section in which the cells were precision diamond-turned by Texas Instruments Inc. The structure has internal water-cooling and vacuum pumping manifolds. Some design details are given for the third section, which is a 206-cell structure with cavities dimensioned to give a Gaussian distribution of dipole mode frequencies. It has conventional-machining surface finishes and external water and pumping manifolds. Component design, fabrication, and assembly brazing are described for the first two experimental sections.

1484 (SLAC-PUB–6185) **A 2–4 nm Linac Coherent Light Source (LCLS) using the SLAC linac.** Winick, H. (and others); Bane, K.; Boyce, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0028;CONF-930511–456: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041077. Source: OSTI; NTIS; INIS; GPO Dep.

We describe the use of the SLAC linac to drive a unique, powerful. short wavelength Linac Coherent Light Source (LCLS). Operating as an FEL, lasing would be achieved in a single pass of a high peak current electron beam through a long undulator by self-amplified spontaneous emission (SASE). The main components are a high-brightness rf photocathode electron gun; pulse compressors; about 1/5 of the SLAC linac; and a long undulator with a FODO quadrupole focussing system. Using electrons below 8 GeV, the system would operate at wavelengths down to about 3 nm, producing $\geq$10 GW peak power in sub-ps pulses. At a 120 Hz rate the average power is $\approx$ 1 W.

1485 (SLAC-PUB–6192) **Linear collider systems and costs.** Loew, G.A. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–458: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041079. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to examine some of the systems and sub-systems involved in so-called "conventional" e^+e^- linear colliders and to study how their design affects the overall cost of these machines. There are presently a total of at least six 500 GeV c. of m. linear collider projects under study in the world. Aside from TESLA (superconducting linac at 1.3 GHz) and CLIC (two-beam accelerator with main linac at 30GHz), the other four proposed e^+e^- linear colliders can be considered "conventional" in that their main linacs use the proven technique of driving room temperature accelerator sections with pulsed klystrons and modulators. The centrally distinguishing feature between these projects is their main linac rf frequency: 3 GHz for the DESY machine, 11.424 GHz for the SLAC and JLC machines, and 14 GHz for the VLEPP machine. The other systems, namely the electron and positron sources, preaccelerators, compressors, damping rings and final foci, are fairly similar from project to project. Probably more than 80% of the cost of these linear colliders will be incurred in the two main linacs facing each other and it is therefore in their design and construction that major savings or extra costs may be found.

1486 (SLAC-PUB–6315) **Interaction region issues at the NLC.** Markiewicz, T.W. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930449–6: International workshop on physics and instrumentation at future linear colliders, Kona, HI (United States), 26-30 Apr 1993). Order Number DE93041084. Source: OSTI; NTIS; INIS; GPO Dep.

The SLAC-based NLC working group has been considering issues relevant to the operation of an X-band 0.5–1.0 TeV collider. This report summarizes some of the results the group has achieved to date. The NLC will collide trains of closely spaced bunches of 10^{10} particles. Typical parameters are 1.4 ns for the inter-bunch spacing, 100 bunches/train, and 180 trains/sec. Its final focus (FF) will provide spot sizes at the interaction point (IP) of dimensions σ_x = 300–400 nm, σ_y = 2–3 nm, and σ_z = 100 μm. The closely spaced bunches and the desire to have each bunch interact only with its partner imply that there must be a crossing angle to the IP. The high charge density will cause backgrounds due to electromagnetic beam-beam interactions and particle detectors with good timing resolution will be required to separate hits from the interaction causing the trigger from the background hits arising from other bunches in the train. The 2 nm beam spots will challenge experimenters to get and keep the beams in collision. They will require special consideration to be given to issues of alignment, ground motion, and vibrations induced by the transfer of cooling fluids. The detector masking must be able to reduce to manageable levels the backgrounds due to synchrotron radiation in the final quadrupoles and to the beam-beam interaction. Simulations of these backgrounds should consider the worst case of 2 beam trains of 10^{12} particles each at 500 GeV.

1487 (SSCL-Preprint–470) **Slow ground motion and operation of large colliders.** Parkhomchuk, V.V. (Budker Inst. of Nuclear Physics, Novosibirsk (Russian Federation)); Shiltsev, V.D.; Stupakov, G.V. Superconducting Super Collider Lab., Dallas, TX (United States). Jul 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (CONF-930511–356: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93018757. Source: OSTI; NTIS; INIS; GPO Dep.

Slow ground motion with frequencies much less than characteristic frequencies of an accelerator usually has been considered as not seriously affecting machine operation because of assumed complete space and time coherence of the magnet displacements.

In this paper, we analyze geophysical and numerous accelerator data on uncorrelated ground motion. We demonstrate that these data in many cases can be approximated by the "ATL law" that assumes diffusive wandering of the ground elements. An equation is derived that governs closed orbit distortion caused by random (though correlated) quadrupole displacements in a large circular accelerator. Estimates for the Superconducting Super Collider (SSC) are carried out and compared with the ability of the corrections system to maintain the orbit in the collider.

1488 (SSCL-Preprint–505) **SPS data on tunnel displacements and the ATL law.** Shiltsev, V. (AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki); Stiening, R. Superconducting Super Collider Lab., Dallas, TX (United States). Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (CONF-9309258–1: 3. international workshop on accelerator alignment, Geneva (Switzerland), 28 Sep - 3 oct 1993). Order Number DE94001095. Source: OSTI; NTIS; INIS; GPO Dep.

In this article we analyze data from long-term measurements of quadrupole displacements in the Super Proton Synchrotron ring at CERN. The variance of displacement can be approximated by ATL law with coefficient A = (0.1–0.4) * 10^{-4} $\mu m^2/s/m$, with T the time interval between measurements and L the distance between two points of the tunnel. The shape of the distribution function is found to be close to Gaussian. The results of the analysis are compared with other data on slow ground motion.

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Refer also to citation(s) 1529, 1530, 1567, 1568, 1571, 1575, 1593, 1596, 1597, 2384, 2771

1489 (BNL–49534) **Symplectic tracking using point magnets in the presence of a longitudinal magnetic field.** Parzen, G. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (AD/RHIC–122). Order Number DE94000732. Source: OSTI; NTIS; INIS; GPO Dep.

In the absence of a longitudinal magnetic field, symplectic tracking can be achieved by replacing the magnets by a series of point magnets and drift spaces. To treat the case when a longitudinal magnetic field is also present, this procedure is modified in this paper by replacing the drift space by a solenoidal drift, which is defined as the motion of a particle in a uniform longitudinal magnetic field. A symplectic integrator can be obtained by subdividing each magnet into pieces and replacing each magnet piece by point magnets, with only transverse fields, and solenoidal drift spaces. The reference orbit used here is made up of arcs of circles and straight lines which join smoothly with each other. For this choice of reference orbit, the required results are obtained to track particles, which are the transfer functions, and the transfer time for the different elements. It is shown that these results provide a symplectic integrator, and they are exact in the sense that as the number of magnet pieces is increased, the particle motion will converge to the particle motion of the exact equations of motion.

1490 (DOE/ER/40150–232) **Studies of multipass beam breakup and energy recovery using the CEBAF injector linac.** Sereno, N.S. (Illinois Univ., Urbana, IL (United States)); Cardman, L.S.; Krafft, G.A.; Sinclair, C.K.; Bisognano, J.J. Continuous Electron Beam Accelerator Facility, Newport News, VA (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC05-84ER40150. Grant PHY-8921146. (CEBAF-PR–93-016). Order Number DE93040866. Source: OSTI; NTIS; INIS; GPO Dep.

Beam breakup (BBU) instabilities in superconducting linacs are a significant issue due to the potentially high Q values of the cavity higher order modes (HOMs). The CEBAF accelerator, which employs high CW current and 5-pass recirculation through two superconducting linacs, poses unique instability problems. An experimental investigation of multipass BBU along with energy recovery has been completed using a single recirculation through the CEBAF injector linac. Experimental results are compared with computer simulation of multipass BBU.

1491 (FNAL-TM–1856) **User's guide to ESME v. 8.1.** MacLachlan, J. Fermi National Accelerator Lab., Batavia, IL (United States). 26 Aug 1993. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94000574. Source: OSTI; NTIS; INIS; GPO Dep.

ESME is a computer program to calculate the evolution of a distribution of particles in energy and azimuth as it is acted upon by the radio frequency system of a proton synchrotron. It provides for the modeling of multiple rf systems, feedback control, space charge, and many of the effects of longitudinal coupling impedance. The capabilities of the program are described, and the requirements for input data are specified in sufficient detail to permit significant calculations by an uninitiated user. The program is currently at version 8.1 and extensively modified since the previous user documentation. Changes since the 7.xx versions include a new command and associated parameters for mapping phase space flow lines, new names for a few parameters, and a few new parameters for old commands. Special attention has been given to features relating to calculation of the collective potential and the generation of phase space trajectories including its effects. The VAX-based code management convention has been modified slightly to permit pre-compile options to be used in the include files as well as the program source files. The biggest change from v. 8.0 to v. 8.1 is the addition of code for HIGZ-based graphics; the new code and that using DI3000/GRAFMAKER are alternatives selectable at compilation. Other changes relate to improved control of smoothing options in the calculation of collective potential, fourier spectra, and mountain range plots.

1492 (INIS-UA–0001, pp. 53-74) **Polarized secondary radioactive beams.** Zaika, N.I. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

Three methods of polarized radioactive nuclei beam production: (a) a method nuclear interaction of the non-polarized or polarized charged projectiles with target nuclei; (b) a method of polarization of stopped reaction radioactive products in a special polarized ion source with than following acceleration; (c) a polarization of radioactive nuclei circulating in a storage ring are considered. Possible life times of the radioactive ions for these methods are determined. General schemes of the polarization method realizations and depolarization problems are discussed.

1493 (JINR-R–9-92-309) **Multibunch resistive wall instability damping with feedback.** Zhabitskij, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Korenev, I.L.; Yudin, L.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 20p. (In Russian). Order Number DE94605823. Source: OSTI; NTIS (US Sales Only); INIS.

The theory of multibunch transverse resistive wall instability damping with feedback is development. The system of coupling equations is obtained for description of bunched beam motion. The general solution and eigen frequencies are found. But for two bunches or multi bunches the tune splitting is found. The band of the tune splitting is calculated. The influence of the tune splitting on the damper system stability is discussed. 14 refs.

1494 (JINR-R–9-93-81) **The separated surface muon beam of the LNP JINR phasotron: The forming scheme and parameters of the beam.** Abazov, V.M.; Bragin, A.N.; Gustov, S.A.; Kutuzov, S.A.; Mirokhin, I.V.; Savchenko, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 15p. (In Russian). Order Number DE94605824. Source: OSTI; NTIS (US Sales Only); INIS.

The separated surface moun beam with the total flux of $5x10^5$ $cm^{-2}s^{-1}$ per 2 μA of the phasotron proton beam current has been obtained at the LNP Phasotron. The position contamination spread is 65-70%. 15 refs.; 6 figs.; 1 tab.

1495 (JINR-R–9-93-82) **The separated surface muon beam of the LNP JINR phasotron: The measure and treatment procedure of the beam two-dimensional amplitude-time spectra.** Abazov, V.M.; Bragin, A.N.; Gustov, S.A.; Kutuzov, S.A.; Mirokhin, I.V.; Savchenko, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 14p. (In Russian). Order Number DE94605825. Source: OSTI; NTIS (US Sales Only); INIS.

The model of the time of flight spectra has been obtained. The method of measuring and calculating of the surface beam parameters has been developed on the base of this model. 11 refs.; 7 figs.

1496 (LBL–33355) **Monte Carlo calculation of multi-electron effects on synchrotron radiation.** Wang, C. Lawrence Berkeley Lab., CA (United States). Jul 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930722–44: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94001259. Source: OSTI; NTIS; INIS; GPO Dep.

The phase space distribution and time structure of an electron beam have fundamental influences on synchrotron radiation properties. These influences are due to the superposition of radiation from all electrons, each following a different trajectory. When the radiation wavelength is longer than the electron bunch length, coherent superposition occurs and results in the observed coherent synchrotron radiation. Usually the wavelength we use is much shorter, so incoherent superposition occurs and the emittance effect is the dominant multi-electron effect. The Monte Carlo simulation is a straightforward and generally valid approach to compute the multi-electron effects on synchrotron radiation. In this paper, we show how the Monte Carlo method can model these multi-electron effects systematically and discuss the statistical principles governing such simulation and their implication on the computing power requirement. We also describe the implementation of an efficient algorithm to calculate a single electron radiation spectrum, which is important to make the Monte Carlo simulation practical. Some calculated results are shown to demonstrate the methods. Comments on the usefulness and limitation of the Monte Carlo method are presented.

1497 (LBL–33432) **The use of harmonics in 3-D magnetic fields.** Caspi, S.; Helm, M.; Laslett, L.J. Lawrence Berkeley Lab., CA (United States). Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930926–18: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94002274. Source: OSTI; NTIS; INIS; GPO Dep.

Motivated by the need for new means for specification and determination of 3-D fields that are produced by electromagnetic lens elements in the region interior to coil windings and seeking to obtain techniques that will be convenient for accurate conductor placement and dynamical study of particle motion, the authors have generalized the representation of a 2-D magnetic field to 3-D. They have shown that the 3-D magnetic field components of a multipole magnet in the curl-free divergence-free region near the axis $r = 0$ can be derived from one dimensional functions $A_n(z)$ and their derivatives. In this report they apply both methods to the "end" region of a 40 mm bore SSC quadrupole, calculating first the field harmonics and then reconstructing the field comparing both results with direct Biot-Savart calculation.

1498 (SLAC-PUB–6102) **Precise system stabilization at SLC using dither techniques.** Ross, M.C.; Hendrickson, L.; Himel, T.; Miller, E. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–416: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040951. Source: OSTI; NTIS; INIS; GPO Dep.

A data acquisition method has been developed at the SLAC Linear Collider (SLC) that provides accurate beam parameter information using sub-tolerance excitation and synchronized detection. This is being applied to several SLC sub-systems to provide high speed feedback on beam parameters such as linac output energy spread. The method has significantly improved control of the linac energy spread. The linac average phase offset (ϕ), used to compensate the effects of longitudinal wakefields, is adjusted ± 1 control bit (about 0.18° S-band or 20% of tolerance), in a continuous fashion. Properly coordinated beam energy measurements provide a measure of the derivative of the accelerating voltage ($dE/d\phi$). The position of the beam on the RF wave can thus be determined to $\pm$ 0.3° in about 5 seconds. The dithering does not contribute significantly to the energy jitter of the SLC and therefore does not adversely affect routine operation. Future applications include control of the interaction region beam size and orientation.

1499 (SLAC-PUB–6108) **Photon pulse filtering and modulation based on the extreme temporal compression and correlated energy spread of the electron bunches in the SLAC Linac Coherent Light Source (LCLS).** Tatchyn, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0022;CONF-930511–415: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040957. Source: OSTI; NTIS; INIS; GPO Dep.

The LCLS photon pulses are expected to attain unprecedented levels of brightness and brevity in the 300–400eV range. Nominally, the photon pulse length will be dominated by the electron bunch length, while the performance of conventional x-ray reflecting and band-shaping optics will be limited by : 1) peak power damage, and 2) transform-limited monochromatization. In this paper we describe how: 1) the correlated energy spread in the electron bunch can be used to selectably compress the LCLS photon pulses to below their nominal length; 2) gas optics can be used to mitigate peak damage problems; 3) the LCLS pulse structure can, in principle, accommodate schemes based on "disposable" optics; and 4) pulse lengthening schemes can be used to extend the attainable degree of monochromatization.

1500 (SLAC-PUB–6118) **Flat beams in the SLC.** Adolphsen, C. (and others); Barklow, T.; Burke, D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–405: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040965. Source: OSTI; NTIS; INIS; GPO Dep.

The Stanford Linear collider was designed to operate with round beams; horizontal and vertical emittance made equal in the damping rings. The main motivation was to facilitate the optical matching through beam lines with strong coupling elements like the solenoid spin rotator magnets and the SLC arcs. Tests in 1992 showed that "flat" beams with a vertical to horizontal emittance ratio of around 1/10 can be successfully delivered to the end of the linac. Techniques developed to measure and control the coupling of the SLC arcs allow these beams to be transported to the Interaction Point (IP). Before flat beams could be used for collisions with polarized electrons, a new method of rotating the electron spin orientation with vertical arc orbit bumps had to be developed. Early in the 1993 run, the SLC was switched to "flat" beam operation. Within a short time the peak luminosity of the previous running cycle was reached and then surpassed. The average daily luminosity is now a factor of about two higher than the best achieved last year. In the following we present an overview of the problems encountered and their solutions for different parts of the SLC.

1501 (SLAC-PUB–6171) **Transverse tails and higher order moments.** Spence, W.L.; Decker, F.J.; Woodley, M.D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–469: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041066. Source: OSTI; NTIS; INIS; GPO Dep.

The tails that may be engendered in a beam's transverse phase space distribution by, e.g., intrabunch wakefields and nonlinear magnetic fields, are all important diagnostic and object of tuning in linear colliders. Wire scanners or phosphorescent screen monitors yield one dimensional projected spatial profiles of such beams that are generically asymmetric around their centroids, and therefore require characterization by the third moment $\langle x^3 \rangle$ in addition to the

conventional mean-square or second moment. A set of measurements spread over sufficient phase advance then allows the complete set $\langle x^3\rangle$, $\langle xx'^2\rangle$, $\langle x'^3\rangle$, and $\langle x^2x'\rangle$ to be deduced – the natural extension of the well-known "emittance measurement" treatment of second moments. The four third moments may be usefully decomposed into parts rotating in phase space at the β-tron frequency and at its third harmonic, each specified by a phase-advance-invariant amplitude and a phase. They provide a framework for the analysis and tuning of transverse wakefield tails.

1502 (SLAC-PUB–6179) **Transverse effects of longitudinal wakefields at high dispersion.** Decker, F.J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–473: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041071. Source: OSTI; NTIS; INIS; GPO Dep.

In high energy linear colliders the transverse beam emittance has to be preserved in order to achieve small interaction spots. Beams with trajectory offsets in cavities excite transverse wakefields which kick the tail of the beam leading to an undesired emittance growth. Here we will concentrate on the longitudinal wakefield creating an energy deviation ΔE_W within the beam. At high dispersion η the beam will be spread out corresponding to its initial (and/or correlated) energy spread ΔE_0 (orΔE_{rf}) and is therefore very sensitive to energy changes. The energy variation ΔE_W will cause a transverse emittance blow up in the high dispersion regions. The effect can be estimated by comparing the betatron size $\sigma_x=\sqrt{\beta\epsilon}$with displacement $\Delta_x=\eta E_W/E$. Some kicks and displacements will compensate each other along the beam line. Simulation results are presented showing how much is really compensated and the final emittance contribution of this effect for the SLC Ring-To-Linac transport line. To minimize it, any vacuum pipe irregularities, like bellows, diameter steps, collimators, etc. should be smoothed or avoided at higher dispersion areas.

1503 (SLAC-PUB–6200) **Electron transport of a Linac Coherent Light Source (LCLS) using the SLAC linac.** Bane, K.L.; Raubenheimer, T.O.; Seeman, J.T. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–428: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040974. Source: OSTI; NTIS; INIS; GPO Dep.

A linac configuration providing a low emittance high peak current electron beam is under study for a potential Linac Coherent Light Source (LCLS) based on the SLAC accelerator. The parameters of the final electron bunch are nearing the technological limits of present accelerators in both transverse and longitudinal phase space. In this note we describe a layout of the RF gun, linac, and bunch compressors to deliver the required bunch properties. We consider a bunch that is generated by an rf gun and accelerated to 7 GeV in 900 m of SLAC linac structure before it enters the wiggler. We assume that the rf gun generates a gaussian beam with an energy of 10 MeV, a population $N = 6 \times 10^9 e^-$, an rms length σ_z = 0.5 mm, an rms energy spread σ_δ = 0.2%, and normalized rms emittances $\gamma\epsilon_{x,y}$ = 3 mm-mrad. At the end of the linac, we require that the peak current $\hat{I} \gtrsim 2.5$ kA and the peak-to-peak energy spread $\Delta\delta \lesssim 0.2\%$. To obtain the required high peak current, we need to compress the bunch length by a factor greater than 10. In deciding at what position in the linac to compress we need to consider three issues: the longitudinal wakefield in the linac, this increases the beam's energy spread and is harder to compensate with short bunches, the transverse wakefield and rf deflections in the linac, these increase the transverse emittance of the beam and are more severe for long bunches, and the effects of phase and current jitter which will change the bunch length and therefore the peak current of the beam. In this paper, we will describe how we compress the bunch to meet these three criteria. Then, we will briefly describe the bunch compressor optics and finally we will mention some details specific to the SLAC site.

1504 (SLAC-PUB–6215) **Disruption effects from the collision of quasi-flat beams.** Chen, Pisin. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–446: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040996. Source: OSTI; NTIS; INIS; GPO Dep.

The disruption effects from the collision of round beams and flat beams in linear colliders have been studied in the past, and has by now been well understood. In practice, however, in the current SLC running condition and in several designs of the next generation linear colliders, the quasi-flat beam geometries are expected. Namely, the beam aspect ratio $R \equiv \sigma_x/\sigma_y > 1$, but not infinitely large. In this regime the disruption effects in both x and y dimensions should be carefully included in order to properly describe the beam-beam interaction phenomena. In this paper we investigate two major disruption effects for the quasi-flat beam regime: The luminosity enhancement factor and the effective beamstrahlung. Computer simulations are employed and simple scaling laws are deduced.

1505 (SSCL–647) **New 2BPM-1K scheme and resistive wall instability.** Lopez, G. Superconducting Super Collider Lab., Dallas, TX (United States). Oct 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE94001774. Source: OSTI; NTIS; INIS; GPO Dep.

One of the main goals of a transverse damping feedback system for the Superconducting Super Collider (SSC) is to control the transverse multibunch instabilities. These instabilities arise due to the interaction of the bunches with the wake field left by previous bunches traveling in the ring. The wake field is the electromagnetic field resulting from the interaction of charged particles in the bunch with the surrounding conductors elements, and it can also be characterized by the associated impedance. The instability that arises due to the resistive beam pipe is called resistive wall instability. Since the SSC Collider machine the injection time is higher than one hour and the storage time at high energy (20 TeV) must be at least 20 hours, the control of the resistive wall instability is of fundamental importance for the Collider to be operational. The most dangerous mode of the beam oscillation is the dipole one which has an estimated growth time between 56 msec and 150 msec. Reference 3 shows that the traditional feedback scheme was not good enough to control (with low gain) the Dipole Mode Multibunch Instability (DMMI) due to the resistive wall impedance. Consequently, a novel two BPM-two kickers transverse feedback system was proposed to control the DMMI much better (the gain could be one order of magnitude lower). This novel system was optimized later on, and it is still under study. Since this system has two kickers, one would like to reduce the cost of the system by looking for the possibility of using one single kicker with other correction scheme. In this paper, a new scheme is shown, using two BPM's and a single kicker, which allows excellent control of the DMMI due to resistive wall impedance and allows a complete cancellation of the coherent oscillations within two turns, when the gain is equal to one and there is no other perturbations.

1506 (SSCL-Preprint–511) **Electron cooling of electron beams.** Larson, D.J. Superconducting Super Collider Lab., Dallas, TX (United States). Sep 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (CONF-9310193–1: CERN workshop on beam cooling and related topics, Geneva (Switzerland), 4-8 Oct 1993). Order Number DE94001096. Source: OSTI; NTIS; INIS; GPO Dep.

Electron cooling of electron (and positron) sources may be important for future linear collider applications. In order to cool electrons with electrons, an intermediary positron beam must be employed, since it is impossible to merge two beams of identical particles into the cooling straight. By adjusting the beta functions of the electron and positron lattices appropriately, the final emittance of the stored electron beam can be made less than the emittance of the cooling electron beam. This paper will discuss accelerator physics issues relating to an electron-cooled electron beam source.

4303 Auxiliaries and Components

Refer also to citation(s) 283, 1253, 1303, 1490, 1506, 1580, 1581, 1583, 1585, 1586, 1587, 1593, 1603, 1605, 1607, 1609, 1799, 1801, 1802, 1808, 2425, 2570, 2572, 2735, 2737, 2798

1507 (ANL/ASD/CP–79651) **Proposed particle-beam characterizations for the APS undulator test line.** Lumpkin, A.H.; Borland, M.; Milton, S. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930855–6: 15. international free electron laser conference, The Hague (Netherlands), 23-27 Aug 1993). Order Number DE93040279. Source: OSTI; NTIS; INIS; GPO Dep.

A research and development effort is underway at the Advanced Photon Source (APS) to use an rf gun as a low-emittance electron source for injection into the 100- to 650-MeV linac subsystem and subsequently to an undulator test area. This configuration would combine the acceleration capability of the 200-MeV S-band electron linac and the in-line 450-MeV positron linac that normally provide positrons to the positron accumulator ring (PAR). A transport line that bypasses the PAR will bring the electrons to the undulator test area. Characterization techniques will be discussed for the electron beam with a normalized, rms emittance of $<10\ \pi$ mm mrad (1σ) at micropulse charges of up to 350 pC and micropulse durations of ~5 ps (FWHM). Tests proposed include measurement of particle beam transport effects (at one-tenth the storage ring beam rigidity) caused by small undulator field errors as well as operations intended to produce coherent, short wavelength radiation (<200 nm).

1508 (ANL/ASD/CP–80971) **Superconducting magnet design for Fixed-Field Alternating-Gradient (FFAG) accelerator.** Abdelsalam, M. (Univ. of Wisconsin, Madison, WI (United States)); Kustom, R. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930926–19: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94002368. Source: OSTI; NTIS; INIS; GPO Dep.

The FFAG accelerator requires static fields that increase with radius along the accelerator midplane according to $B = B_0 (R/R_0)^{13.4}$. The field is generated by equally spaced magnets around the circumference and varies from a maximum of 4.1 T to a minimum of −1.9 T. The general coil design employs cryostable magnets wound with aluminum stabilized superconductor. Each magnet has resistive pole face windings outside of the cryostat to allow for field fine tuning after construction. A set of iron-free coil windings generate the required field distribution.

1509 (ANL/ECT/CP–80138) **Characterization of CCD-based imaging x-ray detectors for diffraction experiments.** Naday, I.; Ross, S.; Kanyo, M.; Westbrook, E.; Westbrook, M. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–6: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE93041343. Source: OSTI; NTIS; INIS; GPO Dep.

High resolution CCD-based imaging detectors are successfully used in X-ray diffraction experiments. Some of the detectors are commercially available, others have been developed by research groups around the world. Reliable comparison of the performance must be based on through testing of all relevant characteristics of these detectors. We describe methods of measurements of detector parameters such as conversion gain, linearity, uniformity, point spread function, geometrical uniformity, dark current, and detective quantum efficiency. As an example for the characterization, test results of a single module fiberoptic taper/CCD X-ray detector will be presented. The projected performance of a large area, array detector consisting of 9 CCD's and fiberoptic taper modules, will be given. This new detector (the "Gold" detector) will be installed on Beamline X8C at the Brookhaven National Laboratory at the NSLS Synchrotron.

1510 (ANL/EP/CP–80799) **Recommissioning and first operation of the CWDD injector at Argonne National Laboratory.** Carwardine, J.A. (AEA Technology, Abingdon (United Kingdom). Culham Lab.); Godden, D.J.; Nightingale, M.P.S.; Pile, G.D.; Den Hartog, P.; Spence, D. Argonne National Lab., IL (United States); Grumman Aerospace Corp., Bethpage, NY (United States). [1992]. 7p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DASG60-88-C-0060. (CONF-9204170–4: Neutral particle beam technical symposium and scientific exchange, Argonne, IL (United States), 28 Apr - 1 may 1992). Order Number DE94001342. Source: OSTI; NTIS; GPO Dep.

The CWDD injector has been shipped to Argonne National Laboratory, installed, and recommissioned. Commissioning progress, operational status, and future plans are reported. Operational experience at ANL is compared with that obtained at Culham.

1511 (ANL/PHY/CP–80460) **Upgrading the ATLAS control system.** Munson, F.H.; Ferraretto, M. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309240–1: 1. Vsystem (vax) workshop and user's group meeting, Upton, NY (United States), 8-10 Sep 1993). Order Number DE93040799. Source: OSTI; NTIS; INIS; GPO Dep.

Heavy-ion accelerators are tools used in the research of nuclear and atomic physics. The ATLAS facility at the Argonne National Laboratory is one such tool. The ATLAS control system serves as the primary operator interface to the accelerator. A project to upgrade the control system is presently in progress. Since this is an upgrade project and not a new installation, it was imperative that the development work proceed without interference to normal operations. An additional criteria for the development work was that the writing of additional "in-house" software should be kept to a minimum. This paper briefly describes the control system being upgraded, and explains some of the reasons for the decision to upgrade the control system. Design considerations and goals for the new system are described, and the present status of the upgrade is discussed.

1512 (ANL/PHY/CP–80620) **Solid material evaporation into an ECR source by laser ablation.** Harkewicz, R.; Stacy, J.; Greene, J.; Pardo, R.C. Argonne National Lab., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308136–2: 5. international conference on ion sources, Peking (China), 31 Aug - 4 sep 1993). Order Number DE93040270. Source: OSTI; NTIS; INIS; GPO Dep.

In an effort to explore new methods of producing ion beams from solid materials, we are attempting to develop a laser-ablation technique for evaporating materials directly into an ECR ion source plasma. A pulsed NdYaG laser with approximately 25 watts average power and peak power density on the order of 10^7 W/cm^2 has been used off-line to measure ablation rates of various materials as a function of peak laser power. The benefits anticipated from the successful demonstration of this technique include the ability to use very small quantities of materials efficiently, improved material efficiency of incorporation into the ECR plasma, and decoupling of the material evaporation process from the ECR source tuning operation. Here we report on the results of these tests and describe the design for incorporating such a system directly with the ATLAS PII-ECR ion source.

1513 (ANL/PHY/CP–80923) **The booster linac for the New Delhi Pelletron.** Potukuchi, P.N. (Nuclear Science Center, New Delhi (India)); Roy, A.; Ajith Kumar, B.P.; Ghosh, S.; Sarkar, A.; Changrani, T.; Mehta, R.; Muralidhar, S.; Mehta, G.K.; Shepard, K.W. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931039–1: 6. workshop on RF superconductivity, Newport News, VA (United States), 4-8 Oct 1993). Order Number DE94001461. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the heavy ion booster linac project for the New Delhi tandem Pelletron accelerator. The superconducting linac will consist of all niobium quarter-wave coaxial-line cavities. A prototype of the accelerating structure has been designed and a room temperature model is tested for the electromagnetic and mechanical properties. Three prototype niobium cavities are nearing completion at the Argonne National Laboratory.

1514 (ANL/XFD/CP–78645) **Preliminary thermo-mechanical analysis of the second phase photon shutters for insertion device beamline front ends at the Advanced Photon Source.** Nian, H.L.T.; Sheng, I.C.A.; Kuzay, T.M. Argonne National Lab., IL

(United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930722–33: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93019750. Source: OSTI; NTIS; INIS; GPO Dep.

The photon shutters (PS) on the insertion device front end of the beamlines at the Advanced Photon Source (APS) are designed to fully intercept powerful 7-GeV undulator radiation. Traditional materials (oxygen-free copper and Glidcop) are used in their construction. Initially, the APS proposes to operate the storage ring at 100 mA. In later phases of operation, the APS will operate the storage ring at 300 mA. The heat flux from the undulators is enormous. For example, in the later phase of the project, the first photon shutter (PS1) placed at a distance of 17 m from the Undulator A source will be subjected to 1400 W/mm^2 at normal incidence with a total power of 11.4 kW. The PS uses an enhanced heat transfer mechanism developed at Argonne National Laboratory, which increases the convective heat transfer coefficient to about 3 W/cm^2 · °C with single phase water as the coolant. To be able to handle the expected three-fold increase in the intense heat flux, some low-Z materials (such as beryllium or graphite), which can absorb the x-rays through their thickness, are now considered as the facing material on the absorber base plate of the PS. Our analysis of PSI indicates that the face plate made of either graphite or beryllium retains its integrity in most of the cases. The maximum effective stress of the absorber plate (made of annealed OFHC) exceeds the yield strength (50 MPa) except in the case of an absorber with a 10-mm graphite face plate.

1515 (ANL/XFD/CP–79799) **Investigation of cooling methods and thickness considerations in the filter/window assembly for synchrotron radiation beamlines.** Wang, Z.; Kuzay, T.M.; Hahn, U. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–4: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE93040680. Source: OSTI; NTIS; INIS; GPO Dep.

Synchrotron x-ray windows are vacuum separators and are usually made of thin beryllium metal. Filters are provided upstream to absorb the soft x-rays so that the window can be protected from overheating, which could result in failure. The filters are made of thin carbon products or sometimes beryllium, the same material as the window. When the synchrotron x-rays pass through a filter or window, part of the photons will be absorbed by the filter or window. The absorbed photons cause heat to build up within the filter or window. Successful filter and window designs should effectively dissipate the heat generated by the absorbed photons and guarantee the safety of the filter and window. The cooling methods typically used in a filter or window design are conduction and radiation cooling or a combination of the two. The different cooling methods were first examined with regard to efficiency and effectiveness in different temperature ranges. Analysis results are presented for temperature distribution and corresponding thermal stresses in the filter and window. Another important issue to be resolved in designing a filter/window assembly is how to select the thickness of the filters and windows. This paper focuses on the criteria for choosing the thickness of a filter: whether it is better to use a few thick filters or a series of thin ones; how to determine the minimum/maximum thickness; and the difference in thickness considerations for the window versus the filter. Numerical investigations are presented.

1516 (ANL/XFD/CP–80250) **Proposed additions to the SHADOW ray-tracing code for general-asymmetric perfect-crystal optics.** Blasdell, R.C.; Macrander, A.T. Argonne National Lab., IL (United States). Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–14: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001291. Source: OSTI; NTIS; INIS; GPO Dep.

The dynamical theory of the diffraction of X-rays from perfect crystals is traditionally expressed in terms of Maxwell's equations using a semi-classical theory originally due to Ewald and von Laue. Combining the work of Batterman and Cole, Caticha and Caticha-Ellis, and Zachariasen, a formalism is obtained that treats the general asymmetric, thick and thin crystal, Laue and Bragg cases within the second order dispersion surface approximation. The authors have implemented this formalism with thick Bragg crystal E-field boundary value conditions in several routines they have added to one of the Advanced Photon Source (APS) versions of the SHADOW ray-tracing code in order to provide the ability to ray trace inclined double-crystal monochromators and high-resolution backscattering analyzers. These additions have been submitted to the University of Wisconsin Center for X-Ray Lithography for consideration for inclusion in the next version of SHADOW.

1517 (ANL/XFD/CP–80251) **Modifications to 8x8 dynamical theory: Polarizations redefined according to x-ray diffraction convention.** Macrander, A.T.; Blasdell, R.C. Argonne National Lab., IL (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–13: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001290. Source: OSTI; NTIS; INIS; GPO Dep.

Dynamical x-ray diffraction theory can be cast in matrix form. In recent years, an 8x8 matrix theory was developed that treated asymmetric reflections from strained crystals. The polarization of the incident, specularly reflected, reflected diffracted, transmitted diffracted, and transmitted electromagnetic wave fields were all defined as s or p. That is, polarizations were defined with respect to the plane containing the incident beam direction and the surface normal. The authors present modifications of the theory to treat σ and π polarizations for Bragg diffraction from asymmetric planes, that is, for polarizations defined with respect to the plane containing the incident beam direction and the reciprocal lattice vector for Bragg diffraction. They present results of this theory for unstrained crystals in the inclined geometry. In this geometry the incident beam wavevector, the reciprocal lattice vector, and the surface normal are not coplanar. The inclined crystal geometry appears promising for use in a high-heat-load monochromator for undulator radiation at the Advanced Photon Source. As expected, they find a weak π-polarization component in the diffracted beam when the polarization of the incident beam is pure σ.

1518 (ANL/XFD/CP–80254) **High heat load x-ray optics research and development at the Advanced Photon Source – An overview.** Lee, Wah-Keat; Mills, D.M. Argonne National Lab., IL (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–17: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001432. Source: OSTI; NTIS; INIS; GPO Dep.

Insertion devices at third generation synchrotron radiation sources such as the APS are capable of producing x-ray beams with total power in excess of 7 kilowatts or power densities of 150 watts/mm^2 at a typical location of the optical components. Optical elements subjected to these types of heat fluxes will suffer considerably unless carefully designed to withstand these unprecedented power loadings. At the Advanced Photon Source (APS), we have an aggressive R&D program aimed at investigating possible methods to mitigate thermal distortions. The approaches being studied include, improved heat exchangers, use of liquid gallium and liquid nitrogen as coolants, novel crystal geometries, power filtering, and replacement of silicon with diamond for crystal monochromators. This paper will provide an overview of the high heat load x-ray optics program at the APS.

1519 (ANL/XFD/CP–80255) **Variable angle asymmetric cut monochromator.** Smither, R.K.; Fernandez, P.B. Argonne National Lab., IL (United States). Sep 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–10: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001287. Source: OSTI; NTIS; INIS; GPO Dep.

A variable incident angle, asymmetric cut, double crystal monochromator was tested for use on beamlines at the Advanced Photon Source (APS). For both undulator and wiggler beams the monochromator can expand area of footprint of beam on surface of the crystals to 50 times the area of incident beam; this will reduce

the slope errors by a factor of 2500. The asymmetric cut allows one to increase the acceptance angle for incident radiation and obtain a better match to the opening angle of the incident beam. This can increase intensity of the diffracted beam by a factor of 2 to 5 and can make the beam more monochromatic, as well. The monochromator consists of two matched, asymmetric cut (18 degrees), silicon crystals mounted so that they can be rotated about three independent axes. Rotation around the first axis controls the Bragg angle. The second rotation axis is perpendicular to the diffraction planes and controls the increase of the area of the footprint of the beam on the crystal surface. Rotation around the third axis controls the angle between the surface of the crystal and the wider, horizontal axis for the beam and can make the footprint a rectangle with a minimum. length for this area. The asymmetric cut is 18 degrees for the matched pair of crystals, which allows one to expand the footprint area by a factor of 50 for Bragg angles up to 19.15 degrees (6 keV for Si[111] planes). This monochromator, with proper cooling, will be useful for analyzing the high intensity x-ray beams produced by both undulators and wigglers at the APS.

1520 (ANL/XFD/CP–80408) **A review of thermo-mechanical considerations of high temperature materials for synchrotron applications.** Kuzay, T.M. Argonne National Lab., IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–9: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001275. Source: OSTI; NTIS; INIS; GPO Dep.

The third generation synchrotron facilities such as the 7-GeV Advanced Photon Source (APS) generate x-ray beams with very high heat load and heat flux levels. Certain front end and beamline components will be required to sustain total heat loads of 3.8 to 15 kW and heat flux levels exceeding 400 W/MM^2 even during the first phase of this project. Grazing geometry and enhanced heat transfer techniques used in the design of such components reduce the heat flux levels below the 30 W/MM^2 level, which is sustainable by the special copper materials routinely used in the component design. Although the resulting maximum surface temperatures are sustainable, the structural stresses and the fatigue issues remain viable concerns. Cyclic thermal loads have a propensity to cause spallation and thermal striping concerns. As such, the steady-state part of the problem is much easier to understand and handle than the time- dependent part. Ease of bonding as well as ultrahigh vacuum and radiation compatibility are additional constraints on material selection for these components. The two copper materials are the traditional OFHC and the newer sintered copper, Glidcop (a trademark product of the SCM Corporation of North Carolina), which are very commonly used in synchrotron components. New materials are also appearing in the form of heat sinks or heat spreaders that are bonded to the base copper in some fashion. These are either partially transparent to x-rays and have engineered volumetric heating and/or very conductive thermally to spread the thermal load in a preferred way. These materials are reviewed critically for high-heat-load or high-heat-flux applications in synchrotrons.

1521 (BNL–49344) **Corrector/quadrupole/sextupole power leads for the Relativistic Heavy Ion Collider at Brookhaven National Laboratory.** Shutt, R.; Hornik, K.; Rehak, M. Brookhaven National Lab., Upton, NY (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930537–107: 5. annual international industrial symposium on the Super Collider and exhibition, San Francisco, CA (United States), 6-8 May 1993). Order Number DE93040178. Source: OSTI; NTIS; INIS; GPO Dep.

In RHIC (Relativistic Heavy Ion Collider), there are 492 CQS (Corrector/Quadrupole/Sextupole) assemblies which require leads to carry the current from the power supply to the magnet. The lead assemblies will contain these leads along with instrumentation voltage taps and current carrying wires that are used only for magnet warm-up. These lead assemblies are analyzed for two cooling schemes: (1) gas flow through the lead tube and (2) heat sinking the lead tube along a 40–70 K heat shield (without gas flow). The analysis was extended to include the modeling of the cold and warm ends and effects of superinsulation shielding the lead assembly against radiation (including heat conduction due to residual gas pressure in the surrounding vacuum). Extensive parametric studies of heat exchange areas, specific copper properties, length of the lead, etc. are also included in the analysis.

1522 (BNL–49347) **Testing of a cryogenic recooler heat exchanger at Brookhaven National Laboratory.** Nicoletti, A.; Wu, K.C. Brookhaven National Lab., Upton, NY (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930703–28: International cryogenic engineering conference and international cryogenic materials conference, Albuquerque, NM (United States), 12-16 Jul 1993). Order Number DE93040166. Source: OSTI; NTIS; INIS; GPO Dep.

Brookhaven National Laboratory has tested a recooler heat exchanger intended to be used in the cryogenic system of the Relativistic Heavy Ion Collider. The unit is required to transfer 225 Watts from a supercritical helium stream flowing at 100 g/s to a helium bath boiling at 4.25 K. Measurements made with heat loads of 50 to over 450 Watts on the unit indicate its cooling capacity is greater than 400 Watts, as expected, and it will be suitable for use in the RHIC ring. Presented are the modifications made to BNL's MAGCOOL test facility that were necessary for testing, test procedure, and recooler performance.

1523 (BNL–49551) **Magnetic performance of a variable period, fast excitation, wiggler.** Gallardo, J.; Romano, T.; van Steenbergen, A. Brookhaven National Lab., Upton, NY (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930926–16: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001894. Source: OSTI; NTIS; INIS; GPO Dep.

With the objective of carrying out an Inverse Free Electron Laser (IFEL) electron accelerator experiment, an iron dominated (Vanadium Permandur) fast excitation, laminated (variable period length) planar wiggler, making use of copper field reflectors, has been constructed and has been measured in several period length tapering configurations. This report presents an analysis and experimental results of this wiggler, typically of which the parameters are $\gamma(w) = 3.7$ cm, $B(max) = 1.8T$.

1524 (DL/SCI/TM–94E) **The performance of photoemission beamline 6.1.** Bailey, P.; Quinn, F.M. Daresbury Lab. (United Kingdom). Mar 1993. 33p. Order Number DE94604559. Source: OSTI; NTIS (US Sales Only); INIS.

The performance of beamline 6.1 has been characterised over several commissioning periods and the results are presented here. The monochromator covers the energy range 20 - 280 eV with an energy resolution of 0.1% of the photon energy. It has been established that a 1200 l/mm blazed grating yields higher flux with lower second order content than a 1200 l/mm lamellar grating. Three electrostatic electron energy analysers are available for use; the fixed MCD HA100 with a resolution of 1.5% of the pass energy; the fixed CMA with a resolution of 2% of the pass energy; and the HA50 on a two axis goniometer with a resolution of 1% of the pass energy. Details are also given of improvements made to the monochromator. (author).

1525 (DOE/ER/40150–213) **Analysis of mechanical fabrication experience with CEBAF's production SRF cavities.** Mammosser, J.; Kneisel, P.; Benesch, J. Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility. Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84ER40150. (CEBAF-PR–93-019;CONF-930511–260: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93017511. Source: OSTI; NTIS; INIS; GPO Dep.

CEBAF has received a total of 360 five-cell niobium cavities, the largest group of industrially fabricated superconducting cavities so far. An extensive data base exists on the fabrication, surface treatment, assembly and cavity performance parameters. Analysis of the mechanical features of the cavities includes the following: the spread in fabrication tolerances of the cells derived from field profiles of the "as fabricated" cavities and the "as fabricated" external Q-values of the fundamental power coupler compared to dimensional deviations. A comparison is made of the pressure sensitivity

of cavities made of materials from different manufacturers between 760 torr (4.2 K) and 23 torr (2 K).

1526 (DOE/ER/40150–215) **Mechanical results of the CEBAF cavity series production.** Mammosser, J.; Benesch, J. Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility. Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84ER40150. (CEBAF-PR–93-021;CONF-930511–254: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93017509. Source: OSTI; NTIS; INIS; GPO Dep.

Interface dimensions of the full production run of 360 CEBAF cavities manufactured by Siemens are summarized. Analysis indicated that length tolerances of ±2 mm and fundamental power coupler location tolerances of ±0.15 mm are achievable on future procurements. Vacuum leaks were a concern early in production but have now been overcome: 2 K helium leak rates integrated over 22 vacuum seals have been measured on 84 cavity pairs and a roughly normal distribution of the $\log_{10}$ (leak rate) is seen, centered about a rate of $10^{-10.2}$ torr-l/s.

1527 (DOE/ER/40150–234) **Operating experience with high beta superconducting rf cavities.** Dylla, H.F.; Doolittle, L.R.; Benesch, J.F. Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility. Jun 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84ER40150. (CEBAF-PR–93-026). Order Number DE93040860. Source: OSTI; NTIS; INIS; GPO Dep.

The number of installed and operational $\beta = 1$ superconducting rf cavities has grown significantly over the last two years in accelerator laboratories in Europe, Japan and the US. The total installed acceleration capability as of mid-1993 is approximately 1 GeV at nominal gradients. Major installations at CERN, DESY, KEK and CEBAF have provided large increments to the installed base and valuable operational experience. A selection of test data and operational experience gathered to date is reviewed.

1528 (ENEA-RTI-INN–93-02) **ENEA Frascati microtron racetrack: Radioisotope production feasibility.** Messina, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Picardi, L.; Ronsivalle, C.; Vignati, A.; Ianni, A.; Lucci, F.; Sandri, S.; Maino, G.; Menapace, E.; Rosetti, M. 1992. 41p. (In Italian). (RTI-INN–93-02). Order Number DE94716597. Source: OSTI; NTIS (US Sales Only).

In assessing the technical-economic feasibility of the production of radioisotopes for medical radiotherapy, this paper first examines the specific radiological characteristics that are required of radioisotopes for this particular field of application. It then compares the suitability, in terms of production capability and energy consumption, of various types of candidate accelerators. The desired equipment specifications are then matched with those of the Frascati microtron which was deigned to extract electrons within an energy range of 15-60 MeV. Brief descriptions are given of the Frascati microtron's equipment arrangement scheme, shielding provisions, diagnostics systems and government licensing requirements. Mathematical models are used to indicate estimated production yields. The paper then tables the range of isotopes which the Frascati microtron is capable of producing and lists, for each isotope, the relative target material requirements, unit production costs and expected yields.

1529 (FNAL/C–93/227) **Defining the systematic and random multipole errors for Main Injector Tracking.** Harfoush, F.A.; Brown, B.C.; Glass, H.D.; Mishra, C.S.; Peggs, S. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930511–486: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94000593. Source: OSTI; NTIS; INIS; GPO Dep.

At the Fermilab Magnet Test Facility (MTF) measurements of magnet field shape and strength have been performed. The tracking of the Fermi Main Injector (FMI) lattice requires a detailed knowledge of the magnetic field quality and its variation from magnet to magnet. As of this date only two prototype dipole magnets have been built, not enough to do a statistical analysis. For this purpose we have used old Main Ping dipole measurements. Measurements on a subset of Main Ring (MR) quadrupoles are also available. From the different sets of measurements available to us we have separated in our simulation the end multipoles from the body multipoles. Such a dissection of the magnet enables us to study more closely the effects of the end multipoles on the performance of the Main Injector. In particular we have studied the closed orbit errors due to variations in effective length of the long and short type dipoles. Tables of multipole errors are presented at both injection (8.9 GeV/c) and slow extraction (120 GeV/c) energies.

1530 (FNAL/C–93/229) **Stability of beam in the Fermilab Main Injector.** Mishra, C.S.; Harfoush, F.A. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930511–489: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94000619. Source: OSTI; NTIS; INIS; GPO Dep.

The Fermilab Main Injector is a new 150 GeV protron synchrotron, designed to remove the limitations of the Main Ring in the delivery of high intensity protron and antiproton beams to the Tevatron. Extensive studies have been made to understand the performance of the Main Injector. In this paper, we present a study of the Main Injector lattice, which includes magnetic and misalignment errors. These calculations shows the Main Injector's dynamical aperture is larger than its design value of 40π mm mradian at injection.

1531 (FNAL/C–93/288) **The Epicure Control System.** Dambik, E.; Kline, D.; West, R. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-931023–1: International conference on accelerator and large experimental control systems, Berlin (Germany), 18-22 Oct 1993). Order Number DE94001217. Source: OSTI; NTIS; INIS; GPO Dep.

The Epicure Control System supports the Fermilab fixed target physics program. The system is distributed across a network of many different types of components. The use of multiple layers on interfaces for communication between logical tasks fits the client-server model. Physical devices are read and controlled using symbolic references entered into a database with an editor utility. The database system consists of a central portion containing all device information and optimized portions distributed among many nodes. Updates to the database are available throughout the system within minutes after being requested.

1532 (FNAL-TM–1555) **A measurement of muon fluences associated with the Fermilab Proton Center charged hyperon beam.** Lach, J.; Shan, L.Y. Fermi National Accelerator Lab., Batavia, IL (United States). 21 Feb 1989. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94002341. Source: OSTI; NTIS; INIS; GPO Dep.

The Fermilab Proton Center (PC) hyperon beam was commissioned in the spring of 1980 and first used by E497 to measure charged hyperon fluxes, polarization and magnetic moments. It has subsequently been used for a number of other experiments requiring beams of charged and neutral hyperons, neutral kaons and neutrons. However, a systematic measurement of muon fluence associated with the beam particles has not been done. This note describes an attempt to do so during the recent run of E756 in the winter of 1987/88. These measurements were done parasitically to the E756 running so that the choice of targets or beam conditions was not always optimal for a systematic study. It is hoped that these measurements will be useful in the estimation of backgrounds for PC experiments as well as for the design of future hyperon beams.

1533 (FNAL-TM–1853) **Beam profile monitors used in the Fermilab fixed target beamlines.** Tassotto, G. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC02-76CH03000. Order Number DE94001353. Source: OSTI; NTIS; INIS; GPO Dep.

A description of the Segmented Wire Ion chambers, typically known as SWICs, is given. These devices have been used at Fermilab since 1972 to monitor the particle beam profiles of the various beamlines. Many modifications and improvements have been made since that time. SWICs are presently used to display beam profiles at intensities from 10^6 to over 10^{13} particles/sec.

1534 (INIS-UA–0001, pp. 21-27) **The INR Kiev radioactive ion beam separator.** Dolinskiy, A.V. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Papash, A.I.; Rudchik, A.T.; Shvedov, A.A.; Val'kov, A.E.; Vishnevskiy, I.N.; Kapustin, A.A.; Kokopin, A.M.; Severgin, Yu.P.; Shukello, I.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The ion-optical scheme parameters of the wide-aperture high-resolution Radioactive Ion Beams Separator (RIBS) are presented. The RIBS was designed using the INR U-240 cyclotron primary beams of light and heavy ions with the energies of MeV and 5-10 MeV/n respectively. Wide angular and momentum range (ω=0±2 C degree, δP/P=±5%) keeping by RIBS, permits to provide full accumulation of nuclei with ultra-small production cross-sections and subsequent high degree separation of radioactive ions from intensive beam of bombarding particles. Two-stage scheme with analyzing magnets and electrostatic separator will be used for the separation of the basic isotopes from background ions.

1535 (INIS-UA–0001, pp. 169-183) **First experimental results from the GSI projectile fragment separator.** Munzenberg, G. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Geissel, H.; Behr, K.H. and others; Brohm, T.; Clerc, H.Y.; Fauerbach, M. and others; Magel, A.; Wolinik, H.; Vieira, D.J. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The GSI projectile fragment separator FRS is a high-resolving forward spectrometer installed at the accelerator SIS for relativistic heavy ions at GSI. FRS is designed for the investigation of heavy ions up to U with energies from 0.1 GeV/u to 2 GeV/u. The combination of SIS and the fragment separator will access the mass region above Kr and the energy region above 0.5 GeV/u for exotic nuclear beams. The combination of FRS and the storage and cooler ring ESR will start a new generation of secondary beam experiments. Presently first experiments with Ne, Ar, Kr, Xe and Au beams of energies between 500 and 2000 MeV/u have been performed. The charge-state distributions of highly stripped ions for a variety of targets and separated projectile fragments up to Au, the heaviest fragments separated with this method up to now are measured. Some first results on the cold fragmentation of Xe and Au are discussed. A brief overview of the experimental program was given.

1536 (INIS-UA–0001, pp. 323-334) **The projectile-fragment separator COMBAS and planned experiments.** Artyukh, A.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The Projectile-Fragment Separator COMBAS, is being constructed at the laboratory of Nuclear Reactions, JINR for providing radioactive nuclear beams. The COMBAS is a compact achromatic beam line with high resolution and large acceptance, which consists of D_1 D_2 D_3 D_4 F_d D_5 D_6 D_7 D_8 F_a Q_1 Q_2 F_a configurations, where $D_{1,2,7,8}$, $D_{3,4,5,6}$ and $Q_{1,2}$ represent dipole, correcting dipole and quadrupole magnets, respectively. The method of isotopic separation is based a combination of the magnetic rigidity analysis and the energy loss. COMBAS in conjunction with the Heavy Ion Accelerator Complex U-400 - U-400 M will extend heavy-ion research to intermediate energies and will start a new generation of secondary-beam experiments and investigation of rare nuclear and atomic process. Some of the planned experiments are presented.

1537 (JINR-E–9-92-406) **Cyclotron autoresonance maser with high Doppler frequency up-conversion.** Arkhipov, O.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Bratman, V.L.; Denisov, G.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 22p. Order Number DE94605842. Source: OSTI; NTIS (US Sales Only); INIS.

A linear induction acceleration (LIA) unit with explosive emission was used as a basis for CARM with high Doppler frequency upconversion when the wave frequency of elelctrons. Using a high-selective Bragg resonator as an electrodynamic system of CARM we investigated two regimes having essentially different properties: the dispersion characteristics of the electron beam and the wave were either intersected or tangential to one another. 19 refs.; 7 figs.

1538 (JINR-E–9-92-459) **Resonance excitation of the SSC beam halo by electric pulses synchronized with RF voltage.** Taratin, A.M.; Tsyganov, E.N.; Shih, H.-J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 11p. (In Russian). Order Number DE94605837. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Instrum. Methods.

Strengthening of longitudinal oscillations of the SSC beam halo particles by means of short electric pulses synchronized with the operating RF voltage has been studied by computer simulation. It is shown that it may be effective to bring the halo particles without perturbing the beam core onto a crystal deflector for the extraction from the SSC. 2 refs.; 9 figs.

1539 (JINR-E–12-92-390) **A facility for liquid-phase radiation experiments on heavy ion beams.** Stuglik, Z.; Zvara, I.; Yakushev, A.B.; Timokhin, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1992. 27p. Order Number DE94605841. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Radiat. Phys. Chem.

The title facility is described, installed on a beam line of the 4-meter U-400 cyclotron in the Flerov Laboratory of Nuclear Reactions, JINR, Dubna. The accelerator provides intermediate energy (some 10 MeV/nucleon) beams of ions from Li to Xe. Preliminary results on the radiolysis of two liquid systems -Fricke solution and malachite green in ethanol - by ^{11}B, ^{24}Mg, and ^{40}Ca ions are presented. Some experimental problems and uncertainities faced at the quantitative evaluation of the data are discussed. 62 refs.; 5 figs.; 2 tabs.

1540 (JINR-R–3-92-350) **The method of measuring the first neutrons generation density space distribution in a pulsed booster.** Anan'ev, V.D. (and others); Voronov, B.I.; Gundorin, N.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 6p. (In Russian). Order Number DE94605844. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to At. Ehnerg.

The development and experimentally verified by authors the measuring method of the first neutrons generation density space distribution by electrons in a pulsed neutron booster is described. The application of this method will be useful for the construction optimization of pulsed neutron boosters. 1 ref.; 3 figs.

1541 (JINR-R–11-92-509) **Expert system for magnetic systems investigations.** Lima, S.; Polyakova, R.V.; Fernandez Nodarse, F.; Yudin, I.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 12p. (In Russian). Order Number DE94605843. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Intern. Conference on Particle Accelerators, May 17-20, 1993, USA.

The paper deals with development of the conception and main functions of the system based on knowledge for magnetic systems investigations. The use of distributed artificial intelligence and co-operating systems is discussed. Some applications are presented. 14 refs.; 2 figs.

1542 (LA-UR–93-3254) **Variable-field permanent magnet quadrupole for the SSC.** Barlow, D.B.; Kraus, R.H. Jr.; Martinez, R.P.; Meyer, R.E. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–3: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000795. Source: OSTI; NTIS; INIS; GPO Dep.

A set of compact variable-field permanent-magnet quadrupoles have been designed, fabricated, and tested for use In the SSC linac matching section. The quadrupoles have 24 mm-diameter apertures and 40 mm-long poles. The hybrid (permanent-magnet and iron) design, uses a fixed core of magnet material (NdFeB) and iron (C-1006) surrounded by a rotating ring of the same magnet material and iron. The quadrupole gradient-length product can be smoothly varied from a minimum of 0.7 T up to a maximum, of 4.3 T by a 90° rotation of the outer ring of iron and magnet material.

1543 (LA-UR–93-3320) **The overview and history of permanent magnet devices in accelerator technology.** Kraus, R.H. Jr. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–9: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000892. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reviews the early history of accelerator development with a particular focus on the important discoveries that opened the door for the application of permanent-magnet materials to this area of science. Researchers began to use permanent-magnet materials in particle accelerators soon after the invention of the alternating gradient principle, that showed magnetic fields could be used to control the transverse envelope of charged-particle beams. Since that time, permanent-magnet materials have found wide application in the modern charged particle accelerator. The history of permanent-magnet use in accelerator physics and technology is outlined, general design considerations are presented, and material properties of concern for particle accelerator applications are discussed.

1544 (LA-UR–93-3321) **Dipole-sheet multipole magnets for accelerators.** Walstrom, P.L. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930926–14: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000891. Source: OSTI; NTIS; INIS; GPO Dep.

The dipole-sheet formalism can be used to describe both cylindrical current-sheet multipole magnets and cylindrical-bore magnets made up of permanent magnet blocks. For current sheets, the formalism provides a natural way of finding a finite set of turns that approximate a continuous distribution. The formalism is especially useful In accelerator applications where large-bore, short, high-field-quality magnets that are dominated by fringe fields are needed. A further advantage of the approach is that in systems with either open or cylindrically symmetric magnetic boundaries, analytical expressions for the three-dimensional fields that are suitable for rapid numerical evaluation can be derived. This development is described in some detail. Also, recent developments in higher-order particle-beam optics codes based on the formalism are described briefly.

1545 (LA-UR–93-3529) **Operational experience with a free-electron laser driven by an rf photoinjector linac.** O'Shea, P.G. Los Alamos National Lab., NM (United States). [1993]. 12p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930722–48: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94000669. Source: OSTI; NTIS; GPO Dep.

For a number of years Los Alamos National Laboratory has been developing photocathode sources of high-brightness electron beams for FEL applications. The APEX FEL, which has been operational for over two years, was the first FEL to use a custom designed rf photoinjector as its electron source. The system consists of a 1.3 GHz, 6 MeV photoinjector with a multi-alkali photocathode illuminated by a frequency doubled ND:YLF drive-laser, followed by three separately powered accelerating structures that give a final electron energy of 40-MeV. The FEL has operated as an oscillator with either a permanent magnet or pulsed electromagnetic wigglers. Originally the FEL was designed to operate at a wavelengths near 3μm, however the electron beam emittance and brightness are sufficient for harmonic lasing at much shorter wavelengths. We have demonstrated the tunability of the device from 0.37 to 11 μm.

1546 (LA-UR–93-3724) **Beam position monitor sensitivity for low-β beams.** Shafer, R.E. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310204–3: Beam instrumentation workshop, Santa Fe, NM (United States), 20-23 Oct 1993). Order Number DE94002692. Source: OSTI; NTIS; INIS; GPO Dep.

At low velocities, the EM field of a particle in a conducting beam tube is no longer a TEM wave, but has a finite longitudinal extent. The net effect of this is to reduce the coupling of the high-frequency Fourier components of the beam current to BPM (beam position monitor) electrodes, which modifies the BPM sensitivity to beam displacement. This effect is especially pronounced for high-frequency, large-aperture pickups used for low-β beams. Non-interceptive beam position monitors used in conjunction with high frequency RFQ (radio-frequency-quadrupole) and DTL (drift-tube-linac) accelerators fall into this category. When testing a BPM with a thin wire excited with either pulses or high-frequency sinusoidal currents, the EM wave represents the principal (TEM) mode in a coaxial transmission line, which is equivalent to a highly relativistic (β = 1) beam. Thus wire measurements are not suitable for simulating slow particle beams in high bandwidth diagnostic devices that couple to the image currents in the beam tube wall. Attempts to load the tin wire either capacitively or inductively to slow the EM wave down have met with limited success. In general, the equations used to represent the 2-D response of cylindrical-geometry BPMs to charged-particle beams make several assumptions: (1) the BPM electrodes are flush with and grounded to the surface of the conducting beam tube; (2) the beam is a line source (pencil beam); (3) the longitudinal extent of the EM field of a beam particle at the beam tube wall is zero, corresponding to a highly relativistic beam. The purpose of this paper is to make some quantitative estimates of the corrections to the conventional approximations when a BPM is used to measure the position of low velocity (low-β) beams.

1547 (LBL–33290-Rev.) **The Advanced Light Source (ALS) Radiation Safety System: Revised.** Ritchie, A.L.; Oldfather, D.E.; Lindner, A.F. Lawrence Berkeley Lab., CA (United States). Aug 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (LSGN–124-Rev.;CONF-930511–353-Rev.: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040636. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Light Source (ALS) at the Lawrence Berkeley Laboratory (LBL) is a 1.5 Gev synchrotron light source facility consisting of a 120 kev electron gun, 50 Mev linear accelerator, 1.5 Gev booster synchrotron, 200 meter circumference electron storage ring, and many photon beamline transport systems for research. Figure 1. ALS floor plan. Pairs of neutron and gamma radiation monitors are shown as dots numbered from 1 to 12. The Radiation Safety System for the ALS has been designed and built with a primary goal of providing protection against inadvertent personnel exposure to gamma and neutron radiation and, secondarily, to enhance the electrical safety of select magnet power supplies.

1548 (LBL–34238) **Advanced Light Source Instrumentation overview.** Kim, C.H.; Hinkson, J. Lawrence Berkeley Lab., CA (United States). Oct 1992. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098.

(CONF-9210246–20: 4. annual accelerator instrumentation workshop, Berkeley, CA (United States), 27-30 Oct 1992). Order Number DE93040302. Source: OSTI; NTIS; INIS; GPO Dep.

The accelerator instrumentation played a vital role in commissioning the ALS injector accelerator. It helped us to see whether electron dynamics agreed with our theoretical predictions and important beam parameters met the design specifications. It helped us to see where beam losses occurred and why. In this paper we will start with a brief description of the ALS accelerator complex and the expected performance of it. Then we will describe each diagnostics instrument by its construction, operational principle, requirements, and our experiences with it. We will describe the wall current monitor, the scintillator, the Faraday cup, the beam collimator, the beam position monitor, the direct-current current transformer (DCCT), the traveling wave electrodes the Sabersky finger, and other special instruments. Finally, we will go into some detail on how we measured the beam emittances, the closed orbit, and the betatron tunes.

1549 (LBL–34253) **Superconducting magnets 1992.** Lawrence Berkeley Lab., CA (United States). Jun 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94002266. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics on Superconducting Magnets; SSC Magnet Industrialization; Collider Quadrupole Development; A Record-Setting Magnet; D20: The Push Beyond 10T; Nonaccelerator Applications; APC Materials Development; High-T_c at Low Temperature; Cable and Cabling-Machine Development; and Analytical Magnet Design.

1550 (LBL–34547) **Performance of the ALS elliptical wiggler.** Wang, C.X.; Schlueter, R.; Hoyer, E.; Heimann, P. Lawrence Berkeley Lab., CA (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930824–7: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001252. Source: OSTI; NTIS; INIS; GPO Dep.

The elliptical wiggler is a circularly polarized light source capable of providing very broad spectral coverage and high degree of circular polarization. The main features of an elliptical wiggler can be understood through analogy to bending magnet radiation. However, some aspects, such as the end structure's influence on the degree of circular polarization, require more elaborate methods to characterize. We present an algorithm based on the stationary phase method, which allows calculation of radiation properties from an arbitrary electron trajectory; so a non-sinusoidal magnetic field's influence on the radiation performance can be taken into account. We show general radiation properties of an ellilptical wiggler and discuss factors affecting radiation performance. Practice issues encountered during the conceptual design of an ellilptical wiggler at the Advanced Light Source are addressed.

1551 (SLAC–419) **Status report on the design of a detector for the study of CP violation at PEP-II at SLAC.** Stanford Linear Accelerator Center, Menlo Park, CA (United States); California Inst. of Tech., Pasadena, CA (United States); Lawrence Berkeley Lab., CA (United States); California Univ., Santa Cruz, CA (United States). Inst. for Particle Physics; Lawrence Livermore National Lab., CA (United States). Jun 1993. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ;FG03-92ER40701 ;AC03-76SF00098 ;FG03-92ER40718 ;FG03-92ER40689. W-7405-ENG-48. Order Number DE94002930. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments designed to measure CP-violating asymmetries in the B meson system must emphasize exclusive state reconstruction with the highest possible resolution and efficiency. In the case of B^0 mesons produced in pairs at the $\Upsilon(4S)$ resonance at an asymmetric e^+e^- storage ring, this capability must be accompanied by precise vertex reconstruction in the direction of the e^+e^- beams (henceforth the z direction). These are difficult requirements, beyond the scope of any existing storage ring detector. The challenge of designing an asymmetric storage ring capable of producing the large number of neutral B meson pairs required to measure CP-violating asymmetries in decays to CP eigenstates has been handsomely met in the PEP-II design. As the first asymmetric e^+e^- storage ring, PEP-II presents a novel set of experimental challenges to a 4π detector. This Status Report describes the design of a new detector fully capable of exploiting the physics opportunities provided by PEP-II.

1552 (SLAC-PUB–6080) **Performance of the SLC polarized electron source with high polarization.** Clendenin, J.E. (and others); Alley, R.K.; Aoyagi, H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–424: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040944. Source: OSTI; NTIS; INIS; GPO Dep.

For the 1992 operating cycle of the SLAC Linear Collider (SLC), the polarized electron source (PES) during its maiden run successfully met the pulse intensity and overall efficiency requirements of the SLC. However, the polarization of the bulk GaAs cathode was low (~27%) and the pulse-to-pulse stability was marginal. We have shown that adequate charge for the SLC can be extracted from a strained layer cathode having P_e~80% even though the quantum efficiency (QE) is < 1%. The recent addition of a separate chamber to the PES-which allows cathodes to be loaded into the gun after the vacuum bake and after high voltage (HV) processing without breaking vacuum-increases the reliability for achieving an adequate photoelectron yield. A new SLAC-built pulsed Ti:sapphire laser permits operation of the PES at the required wavelength with sufficient power to fully saturate the yield, and thus improve the e^- beam stability. The performance of the PES during the 1993 SLC operating cycle with these and other improvements is discussed.

1553 (SLAC-PUB–6085) **Numerical design and analysis of a compact TE_{10} to TE_{01} mode transducer.** Tantawi, S.; Ko, K.; Kroll, N. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930269–22: Computational accelerator physics conference (CAP93), Pleasanton, CA (United States), 22-26 Feb 1993). Order Number DE93040945. Source: OSTI; NTIS; INIS; GPO Dep.

A high-power low-loss mode transducer design has been proposed to adapt the output of the X-Band klystron, WR90 rectangular waveguide, to the input of the pulse compression system, SLED II, which utilizes overmoded circular waveguides operating in the low-loss TE_{01} mode. This device is much more compact than the conventional Marie type mode converters. The device splits the incoming klystron output into two separate rectangular guides that are then fed into a circular guide through a four-slot arrangement. We will use both MAFIA and HFSS to calculate the transmission properties of the three-dimensional structure. We will also determine the extent of mode contamination and compare the numerical results with experiments.

1554 (SLAC-PUB–6145) **High-power rf pulse compression with SLED-II at SLAC.** Nantista, C. (California Univ., Los Angeles, CA (United States). Dept. of Physics); Kroll, N.M.; Farkas, Z.D.; Lavine, T.L.; Menegat, A.; Ruth, R.D.; Tantawi, S.G.; Vlieks, A.E.; Wilson, P.B. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ;FG03-93ER40759 ;FG03-92ER40695. (CONF-930511–449: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041051. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing the peak rf power available from X-band microwave tubes by means of rf pulse compression is envisioned as a way of achieving the few-hundred-megawatt power levels needed to drive a next-generation linear collider with 50–100 MW klystrons. SLED-II is a method of pulse compression similar in principal to the SLED method currently in use on the SLC and the LEP injector linac. It utilizes low-los resonant delay lines in place of the storage cavities of the latter. This produces the added benefit of a flat-topped output pulse. At SLAC, we have designed and constructed a prototype SLED-II pulse-compression system which operates in the circular TE_{01} mode. It includes a circular-guide 3-dB coupler and other novel components. Low-power and initial high-power tests have been made, yielding a peak power multiplication of 4.8

at an efficiency of 40%. The system will be used in providing power for structure tests in the ASTA (Accelerator Structures Test Area) bunker. An upgraded second prototype will have improved efficiency and will serve as a model for the pulse compression system of the NLCTA (Next Linear Collider Test Accelerator).

1555 (SLAC-PUB–6149) **MPS beam control software architecture.** Krauter, K.; Crane, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–450: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041053. Source: OSTI; NTIS; INIS; GPO Dep.

The new Machine Protection System (MPS) now being tested at SLAC has a beam control subsystem resident in processors located close to the beam monitoring devices within the machine. There are two types of beam control micros: Algorithm Processors (AP's) which collect and evaluate data from monitoring devices, and a Supervisor (SUPE) which collects and evaluates data from all the AP's. The SUPE also receives the global machine beamcode indicating beam presence, and passes it on to the AP's. The SUPE receives the beamcode pattern from the Master Pattern Generator (MPG) via a shared-memory communication link. MIL-1553 serial communication is used between the SUPE and the AP's, and between the AP's and the monitoring devices. Multitasking software is used to allow high priority handling of data evaluation and low priority handling of host/user interfacing and event reporting. Pipelining of data between acquisition and evaluation and reporting is used to accomodate the processing capacity, while still supporting full processing at the 360Hz broadcast rate of the beamcode pattern.

1556 (SLAC-PUB–6151) **Analysis of DSP-based longitudinal feedback system: Trials at SPEAR and ALS.** Hindi, H. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Eisen, N.; Fox, J.; Linscott, I.; Oxoby, G.; Sapozhnikov, L.; Serio, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–477: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041055. Source: OSTI; NTIS; INIS; GPO Dep.

Recently a single-channel prototype of the proposed PEP-II longitudinal feedback system was successfully demonstrated at SPEAR and ALS on single-bunch beams. The phase oscillations are detected via a wide-band pick up. The feedback signal is then computed using a digital signal processor (DSP) and applied to the beam by phase modulating the rf. We analyze results in the frequency- and the time-domain and show how the closed-loop transfer functions can be obtained rigorously by proper modeling of the various components of this hybrid continuous/digital system. The technique of downsampling was used in the experiments to reduce the number of computations and allowed the use of the same digital hardware on both machines.

1557 (SLAC-PUB–6155) **MPS Vax monitor and control software architecture.** Allison, S.; Spencer, N.; Underwood, K.; VanOlst, D.; Zelanzy, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–462: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041058. Source: OSTI; NTIS; INIS; GPO Dep.

The new Machine Protection System (MPS) now being tested at the SLAC Linear Collider (SLC) includes monitoring and controlling facilities integrated into the existing VAX control system. The actual machine protection is performed by VME micros which control the beam repetition rate on a pulse-by-pulse basis based on measurements from fault detectors. The VAX is used to control and configure the VME micros, configure custom CAMAC modules providing the fault detector inputs, monitor and report faults and system errors, update the SLC database, and interface with the user. The design goals of the VAX software include a database-driven system to allow configuration changes without code changes, use of a standard TCP/IP-based message service for communication, use of existing SLCNET micros for CAMAC configuration, security and verification features to prevent unauthorized access, error and alarm logging and display updates as quickly as possible, and use of touch panels and X-windows displays for the user interface.

1558 (SLAC-PUB–6166) **AMS: Area Message Service for SLC.** Crane, M.; Mackenzie, R.; Millsom, D.; Zelazny, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–467: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041064. Source: OSTI; NTIS; INIS; GPO Dep.

The Area Message Service (AMS) is a TCP/IP based messaging service currently in use at SLAC. A number of projects under development here at SLAC require and application level interface to the 4.3BSD UNIX socket level communications functions using TCP/IP over ethernet. AMS provides connection management, solicited message transfer, unsolicited message transfer, and asynchronous notification of pending messages. AMS is written completely in ANSI 'C' and is currently portable over three hardware/operating system/network manager platforms, VAX/VMS/Multinet, PC/MS-DOS/Pathworks, VME 68K/pSOS/pNA. The basic architecture is a client-server connection where either end of the interface may be the server. This allows for connections and data flow to be initiated from either end of the interface. Included in the paper are details concerning the connection management, the handling of the multi-platform code, and the implementation process.

1559 (SLAC-PUB–6168) **Development of multimegawatt klystrons for linear colliders.** Caryotakis, G. (and others); Callin, R.; Eppley, K. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–468: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041065. Source: OSTI; NTIS; INIS; GPO Dep.

A number of experimental klystrons have been constructed and evaluated at SLAC, KEK and INP, aiming toward output power objectives of 100 and 120 MW at 11.4 GHz (SLAC and KEK respectively) or 150 MW at 14 GHz (INP), with pulse lengths on the order of 1 μs. Since rf breakdown is considered to be the principal mechanism limiting power for such tubes, most of the effort has been concentrated on the design of output circuits that reduce rf gradients by distributing fields over a longer region of interaction. Another klystron component receiving emphasis has been the output window, where the approach for future tubes may be to use a circular TE01-mode, half-wave window. Rest results to date in this continuing international effort are: 50 MW with 1 μs pulses, using a traveling-wave output circuit (SLAC and INP), and 85 MW with 200 ns. pulse (SLAC), using two conventional reentrant, but uncoupled, output cavities. At KEK a klystron with a single, but not reentrant, cavity has produced 80 MW in 50 ns pulses. Finally, Haimson has demonstrated 100 MW at 50 ns with a traveling-wave output. This paper addresses primarily the work performed at SLAC during the last two years.

1560 (SLAC-PUB–6172) **Prospects for generating polarized electron beams for a linear collider using an RF gun.** Clendenin, J. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Frisch, J.; Schultz, D.; Tang, H.; Yeremian, D.; Aoyagi, H.; Matsumoto, H.; Yoshioko, M.; Nakanishi, T. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9305155–2: Workshop on high intensity electron sources, Legnaro (Italy), 24-28 May 1993). Order Number DE93041067. Source: OSTI; NTIS; INIS; GPO Dep.

The next generation of linear colliders–represented by the Japanese Linear Collider (JLC) and the Next Linear Collider (NLC)–will probably utilize polarized electrons generated by a photocathode gun. A photocathode gun with high polarization (P_e) photocathodes (up to Pe~80% achieved to date) is currently providing polarized electrons for the SLC. The SLC source requires subharmonic bunching at low energy to reduce the bunch length prior to S-band bunching and a damping ring at high energy to

reduce the transverse emittance. The use of an RF gun can eliminate the former and possibly simplify the latter. However, RF guns as presently developed have serious problems with vacuum contamination, which would quickly lower the quantum efficiency (QE) of a semiconductor photocathode. In addition, the "charge limit" previously reported for high peak current pulses puts a limit on the laser power usable for photoexciting a low QE cathode near the bandgap threshold. These problems have so far precluded any serious attempt to design an RF gun for polarized electrons. Several technical advances that now improve the prospects for a practical polarized electron RF gun are described. Finally, new ideas for high polarization photocathodes that permit operation in a relatively poor vacuum and techniques being explored to mitigate the low QE "charge-limit" are discussed.

1561 (SLAC-PUB–6177) **Beam size measurements with noninterceptive off-axis screens.** Decker, F.J.; Brown, R.; Seeman, J.T. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–471: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041069. Source: OSTI; NTIS; INIS; GPO Dep.

At the end of the Stanford Linear Accelerator the transverse distributions of small electron and positron beams ($\sigma \approx 100$ μm) are measured by profile screens. To avoid constant interception and emittance blow-up of the production beams, the beams are deflected with fast magnets on to off-axis screens. One in a 1000 pulses is deflected. The required and achievable resolutions are described in another paper. Here we concentrate more on the magnets, the screen set-up, the readout, and signal processing of the video data. Together with the kicker magnet, two PCs, one for electrons, one for positrons, are triggered recording the next frame of the camera. Hardware and software process this information quickly producing a color-enhanced picture which is displayed in the control-room. With the resulting visual and digital information, the wakefield tails of the beam can be compensated using orbit oscillations. Minute by minute variations and slow drifts of the beam are recognizable.

1562 (SLAC-PUB–6178) **FFT-oriented feedback.** Decker, F.J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–472: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041070. Source: OSTI; NTIS; INIS; GPO Dep.

In the SLC many feedback systems keep the beam under control. Here we concentrate on feedback systems which operate at 120 Hz or lower frequencies, so software can be used to make some decisions. The linac steering feedback uses beam position monitor data and corrects magnet settings to keep the beam orbit to the desired values (mostly flat). Looking at the Fast Fourier Transformation (FFT) of the data, a reduction in the zero and very low frequency component is observed, while on the other hand noise at higher frequencies is amplified. To improve this situation, the FFT can be used to alter the feedback so a flat spectrum can be achieved, indicating the lowest white noise level. If there is a spike at e.g. 2 or 7 Hz or another feedback is oscillating, this feedback would adjust itself till this spike is reduced to the white noise level (not beyond). Different simulation results for the frequency response are presented.

1563 (SLAC-PUB–6180) **Feedback control of coupled-bunch instabilities.** Fox, J.D. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Eisen, N.; Hindi, H.; Linscott, I.; Oxoby, G.; Sapozhnikov, L.; Serio, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–474: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041072. Source: OSTI; NTIS; INIS; GPO Dep.

The next generation of synchrotron light sources and particle accelerators will require active feedback systems to control multi-bunch instabilities. Stabilizing hundreds or thousands of potentially unstable modes in these accelerator designs presents many technical challenges. Feedback systems to stabilize coupled-bunch instabilities may be understood in the frequency domain (mode-based feedback) or in the time domain (bunch-by-bunch feedback). In both approaches an external amplifier system is used to create damping fields that prevent coupled-bunch oscillations from growing without bound. The system requirements for transverse (betatron) and longitudinal (synchrotron) feedback are presented, and possible implementation options developed. Feedback system designs based on digital signal-processing techniques are described. Experimental results are shown from a synchrotron oscillation damper in the SSRL/SLAC storage ring SPEAR that uses digital signal-processing techniques.

1564 (SLAC-PUB–6181) **Progress on PEP-II injection R&D.** Bloom, E.; Bulos, F.; Fieguth, T.; Godfrey, G.; Loew, G.; Miller, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–475: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041073. Source: OSTI; NTIS; INIS; GPO Dep.

The R&D program described in this paper focuses on an improvement of the SLAC linac designed to extract and study a 9 GeV electron beam under stringent control of energy, energy spread, emittance, optical parameters, and timing. The extraction system begins with an on-axis pulsed magnet, followed by a magnetic lattice and diagnostic equipment required for the measurement and optimization of the above beam qualities. Design, construction, and installation of this system is the first step in the development of the overall PEP-II $e^{\pm}$ injection system. This system is required to fill 1658 bunches of 9 GeV electrons (0.99A stored) and 3.1 GeV positrons (2.14A stored) in two separate rings in a total of about 6 minutes from zero ring current (i.e., full-fill mode, 0 to 100%) or in about 3 minutes from 80% ring current (i.e., topping-off mode, 80 to 100%). This unprecedented rate of filling can be met by a judicious use of the SLC linac, damping rings, and positron source.

1565 (SLAC-PUB–6182) **Flower-petal mode converter for NLC.** Hoag, H.A. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Tantawi, S.G.; Callin, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States); California Univ., San Diego, La Jolla, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ;FG03-93ER40759. (CONF-930511–476: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041074. Source: OSTI; NTIS; INIS; GPO Dep.

It is important to minimize power loss in the waveguide system connecting klystron, pulse-compressor, and accelerator in an X-Band NLC. However, existing designs of klystron output cavity circuits and accelerator input couplers utilize rectangular waveguide which has relatively high transmission loss. It is therefore necessary to convert to and from the low-loss mode in circular waveguide at each end of the system. A description is given of development work on high-power, high-vacuum 'flower-petal' transducers, which convert the TE_{10} mode in rectangular guide to the TE_{01} mode in circular guide. A three-port modification of the flower petal device, which can be used as either a power combiner at the klystron or a power divider at the accelerator is also described.

1566 (SLAC-PUB–6198) **Conventional collimation and linac protection.** Irwin, J.; Helm, R.; Nelson, W.R. and Walz, D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–452: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041083. Source: OSTI; NTIS; INIS; GPO Dep.

We describe linac protection and a conventional collimation system appropriate for a next linear collider. The linac accelerating structure can be protected from "worst credible failures" by a system of sacrificial spoilers. For the collimation system we consider the effects of transverse wakefields and the transmission, heating, mechanical stress, and edge-scattering properties of scrapers. We

require local chromatic correction, scraper survival for two pulses of a mis-steered beam containing 0.5 x 10^{12} particles per pulse, average interception capability of 1 % of the beam at any scraper, and zero particles incident on the final doublet in the final focus system. We describe emittance dependent limitations of this system and present formulae which determine scraper gaps. Conventional collimation systems appear adequate to collimate the beams of next generation 0.5 and 1.0 TeV c.m. linear colliders. Though we have combined functional units where possible to reduce total length, the length of our lattices for these systems are longer than 1 km per linac.

1567 (SLAC-PUB–6206) **Third-order corrections to the SLC final focus.** Walker, N.J.; Helm, R.; Irwin, J.; Woodley, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–440: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040987. Source: OSTI; NTIS; INIS; GPO Dep.

The minimum β achievable at the interaction point (β^*) with the current design of the SLC final focus is limited to ~5 mm by third order optical aberrations, most notably the U_{1266} and U_{3466} terms (using the notation of K. Brown). A new lattice is presented which effectively zeros these terms. The remaining third order terms which accrue from the interleaved sextupole pairs in the chromatic correction section (CCS) can be canceled by the inclusion of five octupoles (two in the CCS, and three in the final telescope). The resulting final focus system is corrected to third order for any usable range of β^* (given the constraints on the beam divergence at the interaction point). The potential luminosity obtainable from such a system is also presented.

1568 (SLAC-PUB–6209) **Beam based alignment of the SLC final focus sextupoles.** Emma, P.; Irwin, J.; Phinney, N.; Raimondi, P.; Toge, N.; Walker, N.J.; Ziemann, V. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–443: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040990. Source: OSTI; NTIS; INIS; GPO Dep.

The strong demagnification inherent in final focus systems requires local cancellation of the resulting chromaticty. Strong sextupole pair separated by a -I transform are positioned $\pi/2$ in the betatron phase away from the Interaction Point (IP) in order to cancel chromatic aberrations primarily due to the final quadrupoles. Sextupole alignment is critical in order to provide orthogonal tuning of the chromaticty and, in the case of the SLC, to limit the third and higher order optical aberrations generated from misaligned and 'nested' horizontal and vertical sextupole pairs. Reported here is a novel technique for aligning the beam centroid to the sextupole centers, which uses measurements of the criticality dependent parameter - the beam size at the IP. Results for the SLC final focus sextupoles are presented, where a resolution of <50 μm is achieved.

1569 (SLAC-PUB–6211) **Adding PCs to SLC Control System.** Lahey, T.; Levitt, S.; MacKenzie, R.; Spencer, N.; Underwood, K. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–439: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040992. Source: OSTI; NTIS; INIS; GPO Dep.

The SLAC Controls Department has interfaced IBM-Compatible PCs to the SLC Control System, for use by the Final Focus Test Beam (FFTB) experimenters, who are building new accelerator equipment and developing and testing it at their home institutions. They will bring the equipment to SLAC and integrate it into the control system using a new software package. The machine physicists and operators will use the existing SLC control system applications and database device types to control and monitor the equipment. The PCs support a limited control environment: they run DOS and exchange messages with the existing control system via TCP/IP over ethernet, using the new SLC Area Message Service. This mechanism will also allow SLC to implement other commercial device controllers that can communicate over ethernet and run the same software interface code.

1570 (SLAC-PUB–6268) **Measurement of charge limit in a strained lattice GaAs photocathode.** Saez, P. (and others); Alley, R.; Aoyagi, H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930722–40: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93041016. Source: OSTI; NTIS; INIS; GPO Dep.

The SLAC Linear Collider (SLC) Polarized Electron Source (PES) photocathodes have shown a charge saturation when illuminated with a high intensity laser pulse. This charge limit in the cesium-activated GaAs crystal seems to be strongly dependent on its surface condition and on the incident light wavelength. Charge limit studies with highly polarized strained lattice GaAs materials are presented.

1571 (SLAC-PUB–6273) **Polarized electron beams for linear colliders.** Clendenin, J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9305155–1: Workshop on high intensity electron sources, Legnaro (Italy), 24-28 May 1993). Order Number DE93041017. Source: OSTI; NTIS; INIS; GPO Dep.

Longitudinally polarized electron beams for high energy collisions provide a sensitive way to explore the electroweak process as well as an effective means to measure spin dependent properties of particles. Once created, such beams are readily accelerated by linacs without loss of polarization, although emittance damping rings present potential hazards. The essential elements of a collider necessary for the utilization of polarized electrons are described. The key element is the polarized electron source as illustrated by the SLC which now operates with $P_e \sim 80\%$ in the 50 GeV linac. Possible improvements for future colliders are discussed.

1572 (SLAC-PUB–6306) **Modern theory and applications of photocathodes.** Spicer, W.E.; Herrera-Gomez, A. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0042;CONF-930722–41: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93041022. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last thirty years, the Spicer Three-Step model has provided a very useful description of the process of photoemission for both fundamental and practical applications. By treating photoemission in terms of three successive steps-optical absorption, electron transport, and escape across the surface this theory allows photoemission to be related to parameters of the emitter, such as the optical absorption coefficient, electron scattering mechanisms, and the height of the potential barrier at the surface. Using simple equations and established parameters, the Three-Step model predicts the performance of cathodes and provides detailed understanding of the unexpected phenomena that appear when photocathodes are pushed into new practical domains. As an example, time responses are estimated for existing cathodes, and are found to cover a range of six orders of magnitude. Further, the time response is found to be directly related to the sensitivity (i.e., quantum efficiency) of the cathode. The quantum yield systematically decreases with the time response. Thus, metals are predicted to have the shortest time response (as little as 10^{-15} sec) and the smallest quantum efficiency (as little as 10^{-4} electrons per photon), whereas the negative affinity photocathodes have high yield (as high as 0.6 electrons per photon) but long response times (as long as 10^{-9} sec). Other applications of the Three-Step model are discussed.

1573 (SLAC-PUB–6307) **Physics of high intensity nanosecond electron source.** Herrera-Gomez, A.; Spicer, W.E. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0043;CONF-930722–42: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93041023. Source: OSTI; NTIS; INIS; GPO Dep.

A new high-intensity, short-time electron source is now being used at the Stanford Linear Accelerator Center (SLAC). Using a GaAs negative affinity semiconductor in the construction of the cathode, it is possible to fulfill operation requirements such as peak currents of tens of amperes, peak widths of the order of nanoseconds, hundreds of hours of operation stability, and electron spin polarization. The cathode is illuminated with high intensity laser pulses, and photoemitted electrons constitute the yield. Because of the high currents, some nonlinear effects are present. Very noticeable is the so-called Charge Limit (CL) effect, which consists of a limit on the total charge in each pulse-that is, the total bunch charge stops increasing as the light pulse total energy increases. In this paper, we explain the mechanism of the CL and how it is caused by the photovoltaic effect. Our treatment is based on the Three-Step model of photoemission. We relate the CL to the characteristics of the surface and bulk of the semiconductor, such as doping, band bending, surface vacuum level, and density of surface states. We also discuss possible ways to prevent the Char's Level effect.

1574 (SSCL–644) **EPICS performance evaluation.** Botlo, M.; Jagielski, M.; Romero, A. Superconducting Super Collider Lab., Dallas, TX (United States). Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE94001775. Source: OSTI; NTIS; GPO Dep.

The authors report on the software architecture, some CPU and memory issues, and the performance of the Experimental Physics and Industrial Control System (EPICS). Specifically, they subject each EPICS software layer to a series of tests and extract quantitative results that should be useful to system architects planning to use EPICS for control applications.

1575 (SSCL–646) **Two feedback system schemes for the collider and resistive wall instability.** Lopez, G. Superconducting Super Collider Lab., Dallas, TX (United States). Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE94001776. Source: OSTI; NTIS; INIS; GPO Dep.

Two feedback systems proposed for the SSC Collider are studied from the point of view of the capability for controlling the resistive wall instability. The previous kick subtraction feedback scheme can damp the dipole mode resistive wall instability. However, the feedback system with digital filter processing cannot control this instability.

1576 (SSCL-Preprint–486) **A systems approach to hazard and risk management for the SDC detector.** Lavelle, R.F. Superconducting Super Collider Lab., Dallas, TX (United States). May 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (CONF-930537–105: 5. annual international industrial symposium on the Super Collider and exhibition, San Francisco, CA (United States), 6-8 May 1993). Order Number DE93019822. Source: OSTI; NTIS; INIS; GPO Dep.

The realities of the day seem almost insurmountable: Environmental impact statements, public hearings, stringent enforcement of the existing government ES&H regulations together with new and seemingly costly requirements; the list goes on. It is self-evident that the recent years have seen a significant increase in environmental and system safety awareness. We are now beginning to see the effects of this awakening on the Department of Energy (DOE) and its High Energy Physics (HEP) programs. The days of a laissez-faire and sometimes cavalier approach to safety and environmental issues are over. Environmental awareness and personnel safety are now paramount design criteria. In our environment, the importance of ES&H is now on par with physics performance itself, especially in the eyes of the customer. The predicament is further complicated by budget-driven extensions of development profiles, sometimes elongated out to ten or twelve years. All of these facts combine to render the traditional "post-hoc" safety analysis program obsolete. The predominant question today centers on how HEP Project Managers can implement a cost and performance effective ES&H program. This program must at once address the needs of the customer, the needs of the research, the needs of the public, and must be dynamic enough to be viable over a ten or twelve year development schedule. We must begin by coming to an understanding of our working environment, an understanding of the customer's requirements and a utilization of lessons learned from others who have existed in a similar environment. Surprisingly enough, there is real help in answering these questions. Let's characterize the current HEP environment in which such a program must operate.

1577 (SSCL-Preprint–499) **Performance of the SSC H^- rf volume ion source and linac injector.** Saadatmand, K.; Hebert, J.E.; Okay, N.C. Superconducting Super Collider Lab., Dallas, TX (United States). Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (CONF-9308136–6: 5. international conference on ion sources, Peking (China), 31 Aug - 4 sep 1993). Order Number DE94001093. Source: OSTI; NTIS; INIS; GPO Dep.

The Superconducting Super Collider (SSC) ion source is required to provide a 30-mA H^- beam at 35 keV with a normalized rms emittance (ε_{n-rms}) of less than 0.18 π mm-mrad. An rf-driven volume source was chosen for the commissioning of the SSC linear accelerator (Linac). The divergent ion source output beam is matched into the Radio Frequency Quadrupole accelerator (RFQ) by an electrostatic Low Energy Beam Transport (LEBT). The SSC Linac Injector (consisting of ion source, LEBT, and RFQ) is required to provide 25 mA of H^- beam (pulse width of 9.6–48 μs at 10-Hz repetition rate) at 2.5 MeV with transverse normalized rms emittance ($\varepsilon_{t-n-rms}$) of less than 0.2 π mm-mrad and longitudinal normalized rms emittance ($\varepsilon 1$) of less than $0.82*10^{-6}$ eV-s. The performance of our rf volume source and initial experimental results from the SSC Injector are discussed.

4304 Storage Rings

Refer also to citation(s) 1564, 1607, 1609, 2551

1578 (ANL/APS/IN/VIB–93/6) **The effects of the pedestal/floor interface on the dynamic characteristics of the storage ring girder support assemblies.** Jendrzejczyk, J.A.; Chen, S.S.; Zhu, S.; Mangra, D.; Smith, R.K. Argonne National Lab., IL (United States). May 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001465. Source: OSTI; NTIS; INIS; GPO Dep.

To avoid unacceptable vibration of the storage ring quadrupoles, and to ensure that the established vibration criteria are satisfied, the philosophy from inception of the APS has been (1) to locate and design the machine to minimize motion of the storage ring basemat and, (2) following construction, to monitor machine operation and user experiments to ensure that vibration sources are not introduced. This report addresses the design of the storage ring girder support assemblies, and, specifically, the effect of the pedestal/floor interface on the dynamic characteristics (i.e., resonant frequencies, damping, and mode shape).

1579 (ANL/APS/IN/VIB–93/8) **Response of the rf-extraction-wing balcony and floor, and the storage ring to forced and ambient vibration excitation and coupling to tunnel/basemat.** Jendrzejczyk, J.A.; Wambsganss, M.W.; Smith, R.K.; Rosas-Velez, P. Argonne National Lab., IL (United States). Aug 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94002364. Source: OSTI; NTIS; INIS; GPO Dep.

To ensure successful operation of the APS, vibration of the storage ring quadrupole magnets must be limited to very low levels for frequencies >10 Hz. There will be many sources of vibration, such as pumps, fans, compressors, generators, and other rotating and reciprocating machinery when the APS is operational. In general, such vibration sources are isolated from the structural components and base foundations by vibration dampers and isolators. Pumps are typically mounted on seismic isolators, which are massive bases with response frequencies of <10 Hz, and fans are mounted with elastic-type isolators to minimize vibration coupling. The attenuation of expansion/isolation joints is a very important factor in

predicting the response of the storage ring basemat to the various excitation sources. Several 75-hp pumps are located on the balcony of the rf extraction wing, which is close to the storage ring basemat. The pumps per se may prove to be a vibration excitation source of concern. Additional pumps will be placed in the RF extraction building and could add to the vibration levels. If the dynamic unbalance force of the pump motor, and the efficiency of the associated expansion joints were known, one could predict the response of the storage ring basemat. This information would also be useful in determining the placement of additional pumps. This report discusses vibration tests and measurements that were performed on July 28, 1993, in the rf extraction building. The purpose of the investigation was to study the efficiency of two specific expansion joints: (1) the joint that separates a structural column pad from the extraction wing floor, and (2) the joint that separates the extraction wing floor from the roof of the storage ring tunnel. A small electrodynamic exciter, with a maximum RMS force output of ≈0.5 lb at the frequencies of interest, was used.

1580 (ANL/ASD/CP–78734) **Performance of quadrupole and sextupole magnets for the Advanced Photon Source storage ring.** Kim, S.H.; Doose, C.L.; Kim, K.; Thompson, K.M.; Turner, L.R. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930926–7: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001272. Source: OSTI; NTIS; INIS; GPO Dep.

From the magnetic measurement data of several production quadrupole and sextupole magnets for the storage ring of the Advanced Photon Source, the excitation efficiencies and systematic and random multipole coefficients of the magnets are summarized. The designs of the magnets, which are constrained due to the geometry of the vacuum chamber have rotation symmetries of 180° and 120°. The production data meet the allowed tolerances of a few parts in 10^{-4} for the storage ring.

1581 (ANL/ASD/CP–78735) **Magnetic measurements of the injector synchrotron magnets for the Advanced Photon Source.** Kim, S.H.; Carnegie, D.W.; Doose, C.L.; Hogrefe, R.; Kim, K.; Merl, R.; Turner, L.R. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930926–10: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001335. Source: OSTI; NTIS; INIS; GPO Dep.

The magnetic measurement data of the dipole, quadrupole, and sextupole magnets for the Advanced Photon Source injector synchrotron are summarized. Magnet design and magnetic measurements of the field strength, field shape, and multipole coefficients are described.

1582 (ANL/ASD/CP–78736) **The magnet measurement facility for the Advanced Photon Source.** Kim, S.H.; Doose, C.; Hogrefe, R.; Kim, K.; Merl, R. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930926–8: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001296. Source: OSTI; NTIS; INIS; GPO Dep.

A magnet measurement facility has been developed to measure the prototype and production magnets for the Advance Photon Source. The measurement facility is semi-automatic in measurement control and data analysis. One dipole system and three rotating coil measurement systems for quadrupole and sextupole magnets and corresponding probe coils are described.

1583 (ANL/ASD/CP–80717) **Beam position feedback system for the Advanced Photon Source.** Chung, Y. Argonne National Lab., IL (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310204–2: Beam instrumentation workshop, Santa Fe, NM (United States), 20-23 Oct 1993). Order Number DE94002206. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Photon Source (APS) will implement both global and local beam position feedback systems to stabilize the particle and X-ray beams for the storage ring. The systems consist of 20 VME crates distributed around the ring, each running multiple digital signal processors (DSP) running at 4kHz sampling rate with a proportional, integral, and derivative (PID) control algorithm. The particle and X-ray beam position data is shared by the distributed processors through networked reflective memory. A theory of closed orbit correction using the technique of singular value decomposition (SVD) of the response matrix and simulation of its application to the APS storage ring will be discussed. This technique combines the global and local feedback systems and resolves the conflict among multiple local feedback systems due to local bump closure error. Maximum correction efficiency is achieved by feeding back the global orbit data to the local feedback systems. The effect of the eddy current induced in the relatively thick (1/2 inch) vacuum chamber by the AC corrector magnet field for local feedback systems is compensated by digital filters. Results of experiments conducted on the X-ray ring of the National Synchrotron Light Source and the SPEAR at Stanford Synchrotron Radiation Laboratory will also be presented.

1584 (ANL/OTD-APS/CP–80851) **A status update on the Advanced Photon Source Project–Summer 1993.** Moncton, D.E.; Fenner, R.B. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–19: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94002407. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Photon Source Project has passed the mid-point in its construction. The linac and synchrotron booster enclosures are complete. A portion of the experiment hall has been completed and put into use to support accelerator component assembly, test, and installation. Plans for the user lab/office modules and the central laboratory/office complex are well advanced. Installation of the linac injection system has been completed and commissioning is beginning. Installation and commissioning of the positron accumulator ring, the booster synchrotron, the storage ring, and the rf power systems will follow. Accelerator operations capable of supporting the commissioning of the experimental beamlines is planned for the summer 1995. A strong research program is continuing to produce results supportive of both accelerator and beamline construction and operations. Collaborative Access Teams have been formed to conduct research with the initial set of 32 beamlines that will be available at the completion of the first phase of construction.

1585 (ANL/XFD/CP–80084) **A criterion for the dynamical to kinematical transition of x-ray diffraction on a bent crystal.** Kushnir, V.I.; Macrander, A.T. Argonne National Lab., IL (United States). Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–12: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001297. Source: OSTI; NTIS; INIS; GPO Dep.

It is well known that the peak reflectivity of a bent crystal, generally speaking, is smaller than that of a plane crystal, and it goes to zero when the crystal curvature goes to infinity. The reason for this is the transition between dynamical and kinematical diffraction that takes place as the crystal curvature increases. The physical explanation is as follows: the deviation from exact Bragg position along the beam changes so fast that the thickness over which the beam is within a Darwin width becomes too small to reflect the beam. Bent crystals are widely used as focusing elements in X-ray optics, and estimation of whether or not a bent crystal is still perfect enough to provide good reflectivity is of great importance. Currently the Advanced Photon Source (APS) is considering a number of bent crystals as focusing elements for future APS beamlines, including a sagittaly focusing monochromator and bent backscattering analyzer for inelastic X-ray scattering experiments. A criterion is given in answer to the question: To what extent is it possible to bend a crystal without loss of X-ray peak reflectivity? An expression based on the work of Chukhovskii, Gabrielyan and Petrashen, is formulated that applies to anisotropic cubic crystal and that can be used not only for conventional asymmetric Bragg diffraction, but also for inclined crystal diffraction. The following special cases are treated as examples: isotropic crystal, standard symmetrical Bragg diffraction, extremely asymmetric diffraction, and backscattering

with Bragg angles near 90°. In addition, an asymptotic behavior for high energies is detailed.

1586 (ANL/XFD/CP–80252) **Calibration of the apparent temperature of silicon single crystals as a function of their true temperature and their thickness as determined by infrared measurements.** Smither, R.K.; Fernandez, P.B. Argonne National Lab., IL (United States). Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–11: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001288. Source: OSTI; NTIS; INIS; GPO Dep.

Viewing the surface of objects subjected to high heat fluxes with an infrared camera or infrared sensor has proved to be a very effective method for monitoring the magnitude and distribution of surface temperature on the object. This approach has been quite useful in studies of cooling silicon crystals in monochromators subject to high heat loads. The main drawback to this method is that single crystals of silicon are partially transparent to the infrared radiation monitored in most infrared cameras. This means that the infrared radiation emitted from the surface contains a component that comes from the interior of the crystal and that the intensity of the emitted radiation and thus the apparent temperature of the surface of the crystal depends on the thickness of the crystal and the kind of coating on the back (and/or the front) of the crystal. The apparent temperature of the crystal increases as the crystal is made thicker. A series of experiments were performed at Argonne National Laboratory to calibrate the apparent surface temperature of the crystal as measured with an infrared camera as a function of the crystal thickness and the type of coating (if any) on the back side of the crystal. A good reflecting surface on the back side of the crystal increases the apparent temperature of the crystal and simulates the response of a crystal twice the thickness. These measurements make it possible to interpret the infrared signals from cooled silicon crystals used in past high heat load experiments. A number of examples are given for data taken in synchrotron experiments with high intensity x-ray beams.

1587 (ANL/XFD/CP–80843) **Thermo-mechanical analysis of fixed mask 1 for the Advanced Photon Source insertion device front ends.** Nian, H.L.T.; Shu, D.; Sheng, I.C.A.; Kuzay, T.M. Argonne National Lab., IL (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–16: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001332. Source: OSTI; NTIS; INIS; GPO Dep.

The first fixed mask (FM1) is one of the critical elements on the insertion device front ends of the beamlines at the Advanced Photon Source (APS) now under construction at Argonne National Laboratory (ANL). The heat flux from the APS undulators is enormous. For example, FM1 placed at a distance of 16 m from the Undulator A source will be subjected to 519 W/mm^2 at normal incidence with a total power of 3.8 kW. Due to a high localized thermal gradient on this component, inclined geometry (1.5°) is used in the design to spread the footprint of the x-ray beam. A box-cone-shape geometry was designed due to the limited space available in the front end. The box shape is a highly constrained geometry, which induces larger stress levels than would occur in a plate or a tube. In order to handle the expected higher stress and the stress concentration at the corners, a single Glidcop block (rather than copper) was used in the construction. The FM1 uses an enhanced heat transfer mechanism developed at Argonne National Laboratory, which increases the convective heat transfer coefficient to about 3 W/cm^2.°C with single-phase water as the coolant. The authors simulated the location of the x-ray beam in several places to cover the worst possible case. The maximum temperature (about 180°C) occurs when the beam hits the center of horizontal surface. The maximum effective stress (about 313 MPa) occurs when the x-ray beam hits about the corners.

1588 (DOE/ER/40150–229) **Measurement of spin motions in a storage ring outside the stable polarization direction.** Akchurin, N. (Iowa State Univ. of Science and Technology, Ames, IA (United States). Dept. of Physics); Badano, L.; Bravar, A. Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility. Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84ER40150. (CEBAF-PR–93-010). Order Number DE93040859. Source: OSTI; NTIS; INIS; GPO Dep.

Polarized, stored beams are becoming a more and more important tool in nuclear and high energy physics. In order to measure the beam polarization in a storage ring the polarization vector of the stored beams has to aim, revolution for revolution, over a period of seconds to minutes, into the same, so-called "stable" direction. In this paper measurements at the Indiana University cooler ring (IUCF) are described in which for the first time in a storage ring oscillations of the polarization vector around this stable direction have been measured. The existence and the dynamics of such oscillations are, for instance, important for a new proposed technique for polarizing stored hadron beams.

1589 (INIS-UA–0001, pp. 92-108) **New project of INR (Kiev's) storage accelerating complex.** Dolinskij, A.V. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Papash, A.I.; Pavlov, S.N.; Rudchik, A.T.; Val'kov, A.E.; Vishnevskij, I.N.; Zhmendak, A.V.; Belov, V.P.; Kokorin, A.M.; Makarov, A.A.; Severgin, Yu.P.; Shukejlo, I.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The INR (Kiev) Storage-Accelerating Complex was designed to obtain the electron cooling ion beams of light and heavy ions up to Xe with the energies up to 300 MeV/u. The Complex includes Ion Storage ring (ISR) with cooling System and Fast Booster (FB). The U-240 isochronous cyclotron will be used as the ion beam injector. The ISR consists with eight 45 C degree bending magnets, 32 quadrupole and 8 sextupole lenses forming FODO structure, and with 8 straight sections for the internal targets, electron cooling and injection systems. Maximum energy of electron beam is 100 kV. The solenoid of Cooling System is 3 m. The Fast Booster will be used for the accelerating of ions heavier than Ne to the energies needed for the injection in ISR.

1590 (INIS-UA–0001, pp. 109-117) **The heavy ion storage ring ESR-status and first results.** Eickhoff, H. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Beckert, K.; Franczak, B. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The assembly of the ESR was completed at the end of February 1990. After the first beam injection from the SIS to the ESR took place at the beginning of March 1990 a large variety of machine tests was performed. In order to get strong diagnosis signals most of the experiments were done with a rather intense Ar^{+18}-ion beam. For cooled ions the maximum ion energy was determined by the achievable voltage of the electron cooler and did not exceed 164 MeV/u. One of the main results during this operation time was, that the momentum spread of the ion beam could be cooled down by the electron cooler by a factor of 100 within about 1 second. Numerous experiments were performed to examine and improve the machine-optics (resonances in the working diagram, chromaticity-corrections). By use of the RF-stacking method in combination with electron-cooling the beam-current in the ESR could be raised to 2 m A (Ar^{+18}-ion beam).

1591 (INIS-UA–0001, pp. 118-139) **The 320 k V electron cooler of ESR status and first results.** Schulte, H. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Angert, N.; Beckert, K. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The ESR is a cooler ring with large momentum acceptance $\delta p/p$ 0 of about 2.5%. The design of components, cooler construction, test measurements and early results from the first half year of cooler commissioning.

1592 (JINR-E–9-93-68) **Synchrotron radiation calculations and collimator design for the tau-charm factory.** Kalchev, D.I.; Perel'shtein, E.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 15p. Order Number DE94605856. Source: OSTI; NTIS (US Sales Only); INIS.

Accurate calculations of the synchrotron radiation (SR) in the vicinity of the interaction point of a symmetric e^+-e^- collider at 2.2 GeV (Tau-Charm Factory) are presented. A fast algorithm is described for simulating generation and propagation of the synchrotron radiation produced in the mechine magnetic elements. Configuration of the defending masks is proposed which minimizes the SR detector backgrounds. For this configuration we estimate the total number and the energy spectrum of SR photons entering the detector and also the energy deposition in the first silicon layer of the vertex detector. Both these quantities are far below the allowed limits. 6 refs.; 6 figs.; 6 tabs.

1593 (LA-UR–93-2941) **Machine studies at the Los Alamos Proton Storage Ring.** Macek, R.J. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9305177–13: 12. International collaboration of advanced neutron sources meeting (ICANS), Abingdon (United Kingdom), 24-28 May 1993). Order Number DE93040095. Source: OSTI; NTIS; INIS; GPO Dep.

Results from recent machine development studies at the Los Alamos Proton Storage Ring (PSR) are presented on the origin of the "first-turn" losses, the PSR instability, and volume H^- ion source development. An experiment has been performed to measure the production of excited states of H^0 when 800-MeV H^- ions impinge upon thin (70–300 $\mu g/cm^2$) carbon foils. Preliminary results indicate yields of about 0.5% each for the n = 3 and n = 4 states. Much evidence has been accumulated supporting the hypothesis that the PSR instability is caused by coupled e-p oscillations, but a truly definitive and unambiguous test has not yet been performed. Plans for such a test include installation of hardware to suppress the most copious sources of electrons and experiments to measure the quantity of proton beam in the interbunch gap. Good progress is being made to test and evaluate two promising designs for a new high-intensity, high-brightness volume H^- ion source and on fast chopping of the beam by pulsing the plasma electrode.

1594 (LBL–33237) **Precision alignment of the Advanced Light Source U5.0 and U8.0 undulators.** Humphries, D.; Chin, J.; Connors, R.; Cummings, J.; Keffler, T.; Gath, W.; Hoyer, E.; Kincaid, B.M.; Pipersky, P. Lawrence Berkeley Lab., CA (United States). Jul 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930722–45: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94001260. Source: OSTI; NTIS; INIS; GPO Dep.

The U5.0 and U8.0 undulators for the Advanced Light Source (ALS) incorporate 4.6-m-long, hybrid-configuration magnetic structures. The structures consist of modules with half-period pole assemblies mounted on 0.8-m-long aluminum mounts, which are in turn attached to continuous steel backing beams. The vertical and longitudinal alignment tolerances for the poles of these structures are 25 microns and 50 microns, respectively, over the entire 4.6-m length of the devices. To meet these tolerances, the modules were first aligned individually using an automated coordinate measurement machine and shimming techniques. Several adjustment iterations were required for each module. Averaging and three-dimensional linear least-squares fitting techniques were employed to establish statistically based error reference planes. Graphical spread sheets were used to create representations of vertical and longitudinal pole position errors for alignment. The adjusted modules were installed on the backing beams and aligned relative to each other using laser interferometer techniques. The longitudinal positions of all poles of each module were measured using a simple linear interferometer and associated optics. Because of the differential expansion coefficient between the aluminum modules and steel backing beam, a bilinear temperature-compensation function was applied to the position data to predict periodicity errors at a predetermined operating temperature, which is generally higher than temperatures in assembly and measurement areas. Vertical alignment of the periodic modules was performed by generating vertical pole position error profiles of the full 4.6-m structures. Least-squares-fit planes for each module were calculated and used in making differential vertical and angular adjustments. Repeatability error for these measurements was typically less than 3 microns. In addition, by using difference techniques, systematic profile variations of 1 micron have been resolved.

1595 (LBL–33341) **Analysis of insertion device magnet measurements for the Advanced Light Source.** Marks, S.; Humphries, D.; Kincaid, B.M.; Schlueter, R.; Wang, C. Lawrence Berkeley Lab., CA (United States). Jul 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-930722–47: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94001258. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Light Source (ALS), which is currently being commissioned at Lawrence Berkeley Laboratory, is a third generation light source designed to produce XUV radiation of unprecedented brightness. To meet the high brightness goal the storage ring has been designed for very small electron beam emittance and the undulators installed in the ALS are built to a high degree of precision. The allowable magnetic field errors are driven by electron beam and radiation requirements. Detailed magnetic measurements and adjustments are performed on each undulator to qualify it for installation in the ALS. The first two ALS undulators, IDA and IDB, have been installed. This paper describes the program of measurements, data analysis, and adjustments carried out for these two devices. Calculations of the radiation spectrum, based upon magnetic measurements, are included. Final field integral distributions are also shown. Good field integral uniformity has been achieved using a novel correction scheme, which is also described.

1596 (SLAC-PUB–6197) **Localized chromaticity correction of low-beta insertions in storage rings.** Donald, M. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Helm, R.; Irwin, J.; Moshammer, H.; Sullivan, M.; Forest, E.; Robin, D.; Zholents, A. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Lawrence Berkeley Lab., CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ;AC03-76SF00098 ;AS03-76ER70285. (CONF-930511–453: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041082. Source: OSTI; NTIS; INIS; GPO Dep.

The correction of the chromaticity of low-beta insertions in the storage rings is usually made with sextupole lenses in the ring's arcs. When decreasing the beta functions at the insertion point (IP), this technique becomes fairly ineffective, since it fails to properly correct the higher order chromatic aberrations. Here we consider the approach where the chromatic effects of the quadrupole lenses generating low beta functions at the IP are corrected locally with two families of sextupoles, one family for each plane. Each family has two pairs of sextupoles which are located symmetrically on both sides of the IP. The sextupole-like aberrations of individual sextupoles are eliminated by utilizing optics forming a -I transformation between sextupoles in the pair. The optics also includes bending magnets which preserve equal dispersion functions at the two sextupoles in each pair. At sextupoles in one family, the vertical beta function is made large and the horizontal is made small. The situation is reversed in the sextupoles of the other family. The betatron phase advances from the IP to the sextupoles are chosen to eliminate a second order chromatic aberration. The application of the localized chromatic correction is demonstrated using as an example the lattice design for the Low Energy Ring of the SLAC/LBL/LLNL PEP-II B Factory.

1597 (SLAC-PUB–6216) **Simulations of the longitudinal instability in the SLC damping rings.** Bane, K.L.F. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Oide, K. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 3p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC03-76SF00515. (CONF-930511–44: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93040997. Source: OSTI; NTIS; INIS; GPO Dep.

A longitudinal, single bunch instability has been observed in the SLC damping rings. Beyond a threshold current of 3×10^{10} the energy spread of the beam increases and a "saw-tooth instability" appears. The latter term is meant to describe a rather complicated phenomenon, depending on both current and rf voltage. In one form it describes a cycle that includes a quick increase in bunch length, over a time on the order of a synchrotron period, and then a much slower return to the original length, over a time on the order of a radiation damping time. Although the total relative change in length is only about 10% the resulting unpredictability of the beam properties in the rest of the SLC accelerator makes it difficult, if not impossible, to operate the SLC above the threshold current. With the goal of trying to understand this instability the simulations that are the subject of this paper were begun.Bunch lengthening calculations have been performed before for the SLC damping rings, to obtain the average bunch shape as function of current. The wakefields of all the important vacuum chamber components were first obtained numerically. The dominant elements were found to be many small discontinuities-bellows, masks, transitions, etc. elements that are inductive to the beam. Once the total wakefield had been obtained, and the threshold current was known, the average bunch shapes were found by means of a potential well calculation. The bunch shapes obtained in this way were found to agree very well with measurement results. In this paper we investigate the single bunch behavior of the SLC damping rings using time domain tracking and also a Vlasov Equation approach. Since the earlier bunch length calculations the damping ring vacuum chamber has been modified, by sleeving the bellows. Our results will, therefore, include the effects of this modification.

1598 (SLAC-PUB–6254) **Impedance calculations for the improved SLC damping rings.** Bane, K.L.F.; Ng, C.K. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–430: International particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE93041013. Source: OSTI; NTIS; INIS; GPO Dep.

A longitudinal, single bunch instability is observed in the damping rings of the Stanford Linear Collider (SLC). Beyond a threshold bunch population of 3×10^{10} particles the bunch energy spread increases and a "saw-tooth" variation in bunch length and synchronous phase as functions of time is observed. Although the relative amplitude of the saw-tooth variation is small-only on the order of 10% – the resulting unpredictability of the beam properties in the rest of the SLC accelerator makes it difficult, if not impossible, to operate the machine above the threshold current. An additional problem at higher currents is that the bunch length is greatly increased. When the bunch is very long in the ring it becomes difficult or impossible to properly compress it after extraction. We want to solve both of these problems so that the SLC can run at higher currents to increase the luminosity. In order to solve these problems the vacuum chambers of both damping rings are being rebuilt with the aim of reducing their impedance. According to previous calculations the impedance the SLC damping rings is dominated by the many small discontinuities that are located in the so-called QD and QF vacuum chamber segments – elements such as transitions, masks, bellows-that are inductive to the beam, Since these earlier calculations were performed the bellows of the QD segments have been sleeved, yielding a factor of 2 increase in the instability threshold. In this paper we begin by discussing the gains that might be achieved if we can reduce the impedance of the rings even further. Then we estimate the effect on the total impedance of the actual design changes that are being proposed. Three important elements – the bend-to-quad transitions, the distributed ion pump slots, and the beam position monitor (BPM) electrodes are fully 3-dimensional and will be studied using T3 of the MAFIA computer programs.

1599 (SLAC-PUB–6259) **Model calibration and beam control systems for storage rings.** Corbett, W.J.; Lee, M.J.; Ziemann, V. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930722–39: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93041014. Source: OSTI; NTIS; INIS; GPO Dep.

Electron beam storage rings and linear accelerators are rapidly gaining worldwide popularity as scientific devices for the production of high-brightness synchrotron radiation. Today, everybody agrees that there is a premium on calibrating the storage ring model and determining errors in the machine as soon as possible after the beam is injected. In addition, the accurate optics model enables machine operators to predictably adjust key performance parameters, and allows reliable identification of new errors that occur during operation of the machine. Since the need for model calibration and beam control systems is common to all storage rings, software packages should be made that are portable between different machines. In this paper, we report on work directed toward achieving in-situ calibration of the optics model, detection of alignment errors, and orbit control techniques, with an emphasis on developing a portable system incorporating these tools.

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Refer also to citation(s) 2142

1600 (EGG-M–93041) **Novel fringe scanning/Fourier transform method of synthetic imaging.** Crawford, T.M.; Albano, R.K. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-930722–43: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93018936. Source: OSTI; NTIS; GPO Dep.

We have developed a one-dimensional theory and a computer model for synthetically imaging scenes using a novel fringe scanning/Fourier transform technique. Our method probes a scene using two interfering beams of slightly different frequency. These beams form a moving fringe pattern which scans the scene and resonates with any spatial frequency components having the same spatial frequency as the scanning fringe pattern. A simple, non-imaging detector above the scene observes any scattered radiation from the scene falling onto it. If a resonance occurs between the scanning fringe pattern and the scene, then the scattered radiation will be modulated at the difference frequency between the two probing beams. By changing the spatial period of the fringe pattern and then measuring the amplitude and phase of the modulated radiation that is scattered from the scene, the Fourier amplitudes and phases of the different spatial frequency components making up the scene can be measured. A synthetic image of the scene being probed can be generated from this Fourier amplitude and phase data by taking the inverse Fourier transform of this information. This technique could be used to image objects using light, ultrasonic, or other electromagnetic or acoustic waves.

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Refer also to citation(s) 279, 474, 476, 478, 485, 486, 769, 1211, 1212, 1286, 1300, 1467, 1509, 1551, 1576, 1937, 2022, 2023, 2024, 2204, 2212, 2214, 2216, 2223, 2233, 2318, 2425, 2462, 2463, 2464, 2465, 2466, 2471, 2472, 2488, 2520, 2529, 2554, 2585, 2593, 2687, 2688, 2791, 2850, 2852, 2855, 2857, 2858

1601 (ANL-HEP-CP–93-79) **Automatic scanning and measuring using POLLY.** Fields, T. Argonne National Lab., IL (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930719–1: Conference on the bubble chamber and its role in particle physics, Geneva (Switzerland), 14-16 Jul 1993). Order Number DE94002209. Source: OSTI; NTIS; INIS; GPO Dep.

The HPD and PEPR automatic measuring systems, which have been described by B. Powell and I. Pless at this conference, were developed in the 1960's to be used for what would now be called "batch processing." That is, an entire reel of bubble chamber film

containing interesting events whose tracks had been rough-digitized would be processed in an extended run by a dedicated computer/precision digitizer hardware system, with no human intervention. Then, at a later time, events for which the precision measurement did not appear to be successful would be handled with some type of "fixup" station or process. By contrast, the POLLY system included from the start, not only a computer and a precision CRT measuring device, but also a human operator who could have convenient two-way interactions with the computer and could also view the picture directly. Inclusion of a human as a key part of the system had some important beneficial effects, as has been described in the original papers. In this note the author summarizes those effects, and also points out connections between the POLLY system philosophy and subsequent developments in both high energy physics data analysis and computing systems.

1602 (ANL-HEP-TR–90-89) **Progress report for the scintillator plate calorimeter subsystem.** Argonne National Lab., IL (United States). [1990]. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040800. Source: OSTI; NTIS; INIS; GPO Dep.

Contains article by A. Buehring, N. Hill, and Nasiatka, J.: Mechanical design of the scintillating plate calorimeter subsystem.

This report covers the work completed in FY90 by ANL staff and those of Westinghouse STC and BICRON Corporation under subcontract to ANL towards the design of a compensating calorimeter based on the use of scintillator plate as the sensitive medium. It is presented as five task sections dealing with respectively mechanical design; simulation studies; optical system design; electronics development; development of rad hard plastic scintillator and wavelength shifter and a summary. The work carried out by the University of Tennessee under a subcontract from ANL is reported separately. Finally, as principal institution with responsibility for the overall management of this subsystem effort, the summary here reports the conclusions resulting from the work of the collaboration and their impact on our proposed direction of effort in FY91. This proposal, for obvious reasons is given separately.

1603 (ANL-HEP-TR–90-102) **Optimisation studies for scintillator plate calorimeter.** Job, P.K.; Blair, R.; Price, L. Argonne National Lab., IL (United States). [1990]. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040812. Source: OSTI; NTIS; INIS; GPO Dep.

This note is the preliminary report of the results of optimisation studies at ANL for the proposed scintillator plate calorimeter for SSC. In this note we have tried to optimise some of the basic parameters for the calorimeter with the available simulation tools at ANL. These simulation studies were carried out using EGS4 and GEANT 3.11 (with GHEISHA 7 implementation) on ANL CRAY XMP14 computer. The various input parameters for GEANT and EGS were optimised and validated using the available test beam data. The codes thus validated were used to calculate some of the basic parameters for the scintillator plate calorimeter for SSC with different absorber materials.

1604 (ANL-HEP-TR–91-26) **Central Calorimeter configuration: A study report to the SDC Technical Board.** Kirk, T.B.W.; Wicklund, A.B. Argonne National Lab., IL (United States). 11 Apr 1991. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (SDC–91-00018). Order Number DE93040810. Source: OSTI; NTIS; INIS; GPO Dep.

The single most important determinant of the overall Central Calorimeter (CC) shape is the criterion for depth of hadron shower containment. This criterion and its rapidity dependence is discussed in a companion document to this report titled "Depth Requirements in SSC Calorimeters" by a D. Green et al., SDC-91-00016. The conclusion reached there is that the calorimeter should be 10 λ thick at $\eta = 0$ and increase smoothly to 12 λ at $\eta = 3$. We adopt this criterion in this report and discuss the mechanical properties and design details of a CC that meets this condition.

1605 (ANL-HEP-TR–93-55) **Thermal distortion tests of aluminum and stainless steel plates.** Bielick, E.; Fornek, T.; Spinka, H.; Underwood, D. Argonne National Lab., IL (United States). 25 Jun 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001328. Source: OSTI; NTIS; INIS; GPO Dep.

An important upgrade to the STAR detector at the Brookhaven National Laboratory RHIC accelerator will be an electromagnetic calorimeter. One design being considered for this calorimeter involves cast lead modules covering $\Delta\phi = 6°$ and $0 \leq |\eta| \leq 1$. These modules would consist of alternating layers of lead and sheets of plastic scintillator. The gaps for scintillator between the layers of lead would be created by parallel aluminum plates of thickness $\simeq$6.6 mm = 0.260in. in the mold for the modules. These plates would need to be machined or ground to be reasonably flat, perhaps to $\pm$0.003in., and of uniform thickness from plate to plate. These requirements are imposed by the need to remove the plates from the casting after cooling, and to have good uniformity of the lead layer thickness, which gives good performance for the modules as a calorimeter. Aluminum was chosen for the plates because of its high coefficient of thermal expansion. An important cost in this calorimeter design is associated with the machining or grinding of the plates to proper thickness and flatness. In most cost estimates, it has been assumed that the mold parts could be used many times. This note describes a simple test which was conducted to investigate possible distortions in the plates after repeated heating to temperatures at which the lead would be poured into the mold and cooling.

1606 (ANL-HEP-TR–93-73) **STAR electromagnetic calorimeter R&D progress report, 1 October 1992–31 August 1993.** Argonne National Lab., IL (United States); Johns Hopkins Univ., Baltimore, MD (United States); Michigan State Univ., East Lansing, MI (United States); Texas Univ., Austin, TX (United States); California Univ., Los Angeles, CA (United States); Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). [1993]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000446. Source: OSTI; NTIS; INIS; GPO Dep.

A lead-scintillator sampling electromagnetic calorimeter (EMC) is planned as an upgrade to the STAR detector for the RHIC Accelerator at Brookhaven National Laboratory (BNL). Considerable work on the conceptual design of the calorimeter, and related interfacing issues with the solenoids magnet and the time projection chamber (TPC) subsystems of STAR occurred in the period 1 October 1992 to 31 August 1993 (FY 1993). This report documents and summarizes the conclusions and progress from this work.

1607 (ANL/PHY/CP–80890) **Electron-ion-x-ray spectrometer system.** Southworth, S.H. (National Inst. of Standards and Technology, Gaithersburg, MD (United States)); Deslattes, R.D.; MacDonald, M.A.; LeBrun, T. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930824–15: Synchrotron radiation instrumentation, Gaithersburg, MD (United States), 23-26 Aug 1993). Order Number DE94001348. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe a spectrometer system developed for electron, ion, and x-ray spectroscopy of gas-phase atoms and molecules following inner-shell excitation by tunable synchrotron radiation. The spectrometer has been used on beamline X-24A at the National Synchrotron Light Source for excitation-dependent studies of Ar L-shell and K-shell photoexcitation and vacancy decay processes. The instrumentation and experimental methods are discussed, and examples are given of electron spectra and coincidence spectra between electrons and fluorescent x-rays.

1608 (ANL/RE/CP–78949) **Associated-particle sealed-tube neutron probe for characterization of materials.** Rhodes, E. (Argonne National Lab., IL (United States)); Dickerman, C.E.; Peters, C.W. Argonne National Lab., IL (United States). 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001341. Source: OSTI; NTIS; GPO Dep.

A neutron diagnostic probe system has been developed that can identify and image most elements having a larger atomic number than boron. It can satisfy van-mobile and fixed-portal requirements for nondestructive detection of contraband drugs, explosives, and nuclear and chemical warfare weapon materials, and for treaty verification of sealed munitions and remediation of radioactive waste.

The probe is based on a nonpulsed associated-particle sealed-tube neutron generator (APSTNG) that interrogates the object with a 14-MeV neutrons and detects alpha-particle associated with each neutron. Gamma-ray spectra of resulting neutron reactions (primarily inelastic scattering) identify nuclides associated with drugs, explosives, and other contraband. Flight times determined from detection times of gamma-rays and alpha-particles yield a separate coarse tomographic image of each identified nuclide. Chemical substances are identified and imaged by comparing relative spectra fine intensities with ratios of elements in reference compounds. The High-energy neutrons in gamma-rays will penetrate large objects and dense materials. The source and emission detection systems can be on the same side, allowing measurements with access to one side only. A high signal-to-background ratio is obtained and maximum information is extracted from each detected gamma-ray, yet high-bandwidth data acquisition is not required. The APSTNG also forms the basis for a compact fast-neutron transmission imaging system. No collimators are required, and only minimal shielding is needed. The small and relatively inexpensive neutron generator tube exhibits high reliability and can be quickly replaced. The detector arrays and associated electronics can be made reliable with low maintenance cost.

1609 (ANL/XFD/CP–80859) **A large area detector for x-ray applications.** Rodricks, B.; Huang, Qiang; Hopf, R.; Wang, Kemei. Argonne National Lab., IL (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309273–1: 3. London conference on positron sensitive detectors, London (United Kingdom), 6-10 Sep 1993). Order Number DE94001294. Source: OSTI; NTIS; INIS; GPO Dep.

A large area detector for x-ray synchrotron applications has been developed. The front end of this device consist of a scintillator coupled to a fiber-optic taper. The fiber-optic taper is comprised of 4 smaller (70 mm x 70 mm) tapers fused together in a square matrix giving an active area of 140 mm x 140 mm. Each taper has a demagnification of 5.5 resulting in four small ends that are 12 mm diagonally across. The small ends of each taper are coupled to four microchannel-plate-based image intensifiers. The output from each image intensifier is focused onto a Charge Coupled Device (CCD) detector. The four CCDs are read out in parallel and are independently controlled. The image intensifiers also act as fast (20 ns) electronic shutters. The system is capable of displaying images in real time. Additionally, with independent control on the readout of each row of data from the CCD, the system is capable of performing high speed imaging through novel readout manipulation.

1610 (BARC–1993/E/010) **Tritium monitoring : present status.** Rathnakaran, M. (Bhabha Atomic Research Centre, Bombay (India). Environmental Assessment Div.); Singh, A.N. Bhabha Atomic Research Centre, Bombay (India). 1993. 49p. Order Number DE94604640. Source: OSTI; NTIS (US Sales Only); INIS.

The report summarizes the present status of techniques employed for the monitoring of tritium in water, air and other samples. A brief mention of the work done by numerous workers in the field, critical comments about the work and a fairly exhaustive list of references about the work done during the last 4 decades has been presented. On-line monitoring on real time basis in nuclear reactors is also discussed. (author). 83 refs., 10 refs., 2 tabs.

1611 (CEA-CONF–11512) **Properties of membranes to permeation to radon 222. New development for the measurement of radon 222 in water and water-saturated soils.** Labed, V. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environment et des Installations); Robe, M.C.; Rannou, A.; Tymen, G. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 5p. (CONF-9210412–: Congress Euromembrane 92, Paris (France), 5-8 Oct 1992). Order Number DE94604653. Source: OSTI; NTIS (US Sales Only); INIS.

Membranes that exclude water but are permeable to radon can extend the range of environments in which many radon detection systems could operate. We have studied the permeation of ^{222}Rn through membranes separating air and water phases. The permeation coefficients and the activation energy were calculated for various conditions. Potential applications such as in situ detection of radon in water are discussed.

1612 (CNIC–00644) **A new automatic analyzer for uranium determination.** Xia Buyun (Beijing Research Inst. of Chemical Engineering and Metallurgy, CNNC (China)); Zhu Yaokun; Wang Bin; Cong Peiyan; Zhang Lan. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 13p. (In Chinese). (BICM–0006.). Order Number DE94604654. Source: OSTI; NTIS (US Sales Only); INIS.

An intellectual automatic analyzer for uranium based on the principle of flow injection analysis (FIA) has been developed. It can directly determine the uranium solution in range of 0.02 to 500 mg/L without any pre-process. A chromatographic column with extractant, in which the trace uranium is concentrated and separated, has special ability to enrich uranium, is connected to the manifold of the analyzer. The analyzer is suited for trace uranium determination in varies samples. The 2-(5-bromo-2-pyridylazo)-5-diethylaminophenol (Br-PADAP) is used as color reagent. Uranium is determined in aqueous solution by adding cation surfactant, cetylpyridinium bromide (PCB). The rate of analysis is 30 to 90 samples per hour. The relative standard deviation of determination is 1% ≈ 2%. The analyzer has been used in factories and laboratory, and the results are satisfied. The determination range can easily be changed by using a multi-function auto-injection valve that changes the injection volume of the sample and channels. So, it could adopt varies FIA operation modes to meet the needs of FIA determination for other substance. The analyzer has universal functions.

1613 (CNIC–00687) **Experiment of neutron multiplication in beryllium.** Jiang Wenmian (Southwest Inst. of Nuclear Physics and Chemistry, Sichuan (China)); Chen Yuan; Chen Gang; Liu Rong; Guo Haiping; Chen Wenjiang; Shen Jian. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 15p. (SINPC–0002.). Order Number DE94604605. Source: OSTI; NTIS (US Sales Only); INIS.

Using the Total Absorption Method, the neutron multiplications in beryllium have been measured. A deionized water sphere with the radius of 75 cm and a polyethylene sphere with the radius of 69 cm were used as the total neutron absorbers. Neutron distributions in the spheres were measured using ^{235}U fission chambers. The relative and the efficiency-determined methods were compared. Important sources of experimental errors were analyzed in detail. Four groups of neutron multiplications in beryllium up to 14.85 cm thick for two total absorbers and two methods of measurement have been obtained and the agreement among them is satisfactory. Measured results have been compared with ANISN calculations. It is shown that the measured results are 3% to 14% and 1% to 7% lower than the calculations using ENDF/B-IV and ENDF/B-VI respectively.

1614 (DOE/ER/40661–6) **Indiana University High Energy Physics Group, Task C: Technical progress report, November 1, 1992–October 31, 1993.** Bower, C.; Heinz, R.; Mufson, S.; Musser, J. Indiana Univ., Bloomington, IN (United States). Dept. of Physics. 26 Apr 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER40661. Order Number DE94000962. Source: OSTI; NTIS; INIS; GPO Dep.

The Indiana University Task C group is participating in the experiments GEM at the SSC and MACRO at the Gran Sasso. After an introduction to GEM in ¶II, a detailed report is presented on the work done during the current contract period on the design of the outer region of the GEM Central Tracker. The Central Tracker Monte Carlo, which was the other significant GEM activity by the group, is included. In ¶III is introduced MACRO and a brief status report is given. Muon Astronomy analysis done using MACRO data is also presented.

1615 (DOE/ER/45429–2) **[Construction of a small angle neutron scattering spectrometer for investigation of microemulsions and micellar solutions in bulk, in porous materials and under shear]: Progress report [Phase 1, July 1, 1990–June 30, 1993].** Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Nuclear Engineering. [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER45429. Order Number DE93019936. Source: OSTI; NTIS; GPO Dep.

This report presents the status of the small-angle diffractometer; 3-D microstructure of bicontinuous microemulsions from SANS and simulation; local geometry of the surfactant monolayer in microemulsions; surface ordering in microemulsions; dynamics of water-in-oil droplet microemulsions; and micellar formation and correlation in the cavity of porous silica glass.

1616 (DOE/OR/00033--T571) **Development and evaluation of a neutron-gamma mixed-field dosimetry system based on a single thermoluminescence dosimeter.** Herminghuysen, K.R. (Ohio State Univ., Columbus, OH (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Ohio State Univ., Columbus, OH (United States). 1993. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94001414. Source: OSTI; NTIS; GPO Dep.

A neutron-gamma mixed-field dosimetry system based on a single lithium fluoride thermoluminescence dosimeter was developed. The system's ability to perform in the mixed neutron-gamma field of the lead/bismuth irradiation facility at the Ohio State University Research Reactor was then evaluated. Such a system is needed to gather accurate dosimetry data for radiobiology experiments which are performed in the lead/bismuth facility. The system was found to be inadequate for the purpose of measuring both dose components in the irradiation facility. In that environment, the system's response to the gamma radiation is obscured by the response to neutron radiation. A sensitivity analysis was performed to estimate the system's performance under different conditions, in order to determine the condition for which the system is useful for resolving both the gamma and the neutron components of the dose.

1617 (ENEA-RT-ERG-NUC--93-10) **Analysis of HLLW and its simulated solution by graphite furnace atomic absorption spectrometry.** Cali, V. (ENEA, Saluggia (Italy). Centro Ricerche Energia); Troiani, F.; Pagliai, V.; Liyun, J. ENEA, Saluggia (Italy). Centro Ricerche Energia. Jun 1993. 45p. (RT/ERG-NUC--93-10). Order Number DE94716521. Source: OSTI; NTIS (US Sales Only).

The application of graphite furnace atomic absorption spectrometry to the analysis of high level liquid waste (HLLW) and its simulated solution are presented. A commercial instrument was modified to meet above requirement, the graphite furnace and the associated autosampler were enclosed in a specially designed glove box. Based on operating condition experiments, optimized instrumental parameters and chemical process for the 10 investigated elements have been selected. The method's precision and accuracy, estimated by technique of standard additions, are in the range of 3-10%. A series of samples taken from SERSE process have been analyzed. The data obtained satisfied the needs of SERSE process.

1618 (IFVE-ONF--92-140) **Hadron calorimeter on the gas pressurized cylindrical ionization chamber.** Batalov, A.A. (and others); Vorob'ev, A.P.; Golovkin, V.F. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 14p. (In Russian). Order Number DE94606062. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal PTEh.

The paper describes the prototype of the module structure hadron calorimeter with cylindrical pressurized gas tubes. The noise characteristics for two methods of analog signals summing are compared. The energy resolution of the prototype has been tested in pion beam with the momentum 31, 43, 56 GeV/c. The coordinate resolution of the calorimeter has been estimated for the pion momentum 56 GeV/c. The next steps to improve the main characteristics of the device are indicated. 4 refs.; 10 figs.; 2 tabs.

1619 (INIS-BR--3148, pp. 168-170) **Circuit for current measures from ionization chambers.** Mello, F.L.V. de (Minas Gerais Univ., Belo Horizonte, MG (Brazil). Dept. de Engenharia Nuclear); Oliveira, A.H. de; Rezende, R.S. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The design and the specifications of an ammeters of low cost for small current, IOE-14 Ampere, from ionization chambers or others transducers used in nuclear instrumentation are described. Special attention is given to the integrated electronic components, available in the brazilian market. (C.G.C.).

1620 (INIS-BR--3148, pp. 171-174) **Fast amplification system for gamma spectroscopy.** Jesus, E.F.O. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Escola de Engenharia); Lopes, R.T. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

An amplification system for gamma spectroscopy with high counting rates was developed. The system was constructed with operational amplifiers, and tested and compared with ORTEC conventional system, using Iridium-192 as source of 9,25 x $10^{1}0$ Bq of activity and NaI (Tl) detector. The constructed system showed a better performance in relation to efficiency and resolution parameters, tested before. (C.G.C.).

1621 (INIS-BR--3148, pp. 175-178) **Change of energy dependence for X-rays of photodiode detector.** Silva, M.F. da (Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia); Teixeira, D.L.; Freitas, L.C. de. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The energy dependence of photodiode Siemens SFH-206 for X-rays beams of 24 kV to 50 kV was studied and compared with the ionization chamber of parallel plates. The photodiode presented 450% of maxim change response for the energy band studied. A study was made, using aluminium, acrylic, mylar aluminized and mylar graphitized filters and showed that the two last reduce this maxim change response to 101% and 108%, respectively. (C.G.C.).

1622 (INIS-BR--3148, pp. 179-182) **Automatic system for evaluation of ionizing field.** Pimenta, N.L. (Fundacao Universidade do Amazonas, Manaus, AM (Brazil). Fundacao Centro de Analise, Pesquisa e Inovacao Tecnologica); Calil, S.J. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology*

and Nuclear Medicine; Brazilian Meeting on Radiological Protection. Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A three-dimensional cartesian manipulator for evaluating the ionizing field and able to position a ionization chamber in any point of the space is developed. The control system is made using a IBM microcomputer. The system aimed the study of isodose curves from ionizing sources, verifying the performance of radiotherapeutic equipment. (C.G.C.).

1623 (INIS-BR–3148, pp. 183-185) **Specification of a dosimetric system for daily monitoring of linear accelerators.** Khoury, H.J. (Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear); Melo, F.A. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A dosimetric system that allow a quick monitoring of radiotherapeutic equipment, giving information about the beam energy and the uniformity of radiation field is shown. Commercial photodiodes are used in this system as radiation detectors. Measures are made with the linear accelerators of 6 MV and 10 MV. (C.G.C.).

1624 (INIS-BR–3148, pp. 295-297) **Specification and tests of three prototypes from tissue-equivalent ionization chamber.** Teixeira, D.L. (Instituto de Engenharia Nuclear (IEN), Rio de Janeiro, RJ (Brazil)); Cardoso, D.O.; Pereira, O.S.; Nobre Filho, L.S.; Cabral, T.S. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Three prototypes of tissue-equivalent ionization chamber are specified and tested. The results obtained by these prototypes are presented, aiming the determination of operation parameters, defined by IEC 395 standard. (C.G.C.).

1625 (INIS-BR–3148, pp. 436-439) **Counting system for nuclear medicine.** Obadia, I.J. (Instituto de Engenharia Nuclear (IEN), Rio de Janeiro, RJ (Brazil)); Silva, C.B. da. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The counting system model 135002 for nuclear medicine is presented, having as basic use the examination of thyroid function and 'in vivo' and 'in vitro' counting experiences of radioactive material. The system is evaluated and approved by Nuclear Medicine Service of Pedro Ernesto University Hospital. (C.G.C.).

1626 (INIS-BR–3148, pp. 577-580) **Development of a new personnel dosemeter with Ca So_4:Dy+ PTFE.** Cardenete, C.M. (Instituto Paulista de Dosimetria das Radiacoes S.C., Ltda., Sao Paulo, SP (Brazil)). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A new personnel dosimeter was developed with substitution plane geometric in metallic filters. The evaluation method was based in linear comparison of responses over several filters. This method was tested, simulating fields of mixed energy, and it was obtained an average derivation of (11+-5)% and lower derivations to 20% in all calibration interval. (C.G.C.).

1627 (INIS-BR–3148, pp. 581-584) **Development of Mg B_4 O_7:Dy thermoluminescent solid dosemeter for using on the thermal neutron dosimetry.** Potiens Junior, A.J. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Campos, L.L.; Todo, A.S. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The magnesium tetraborate doped with dysprosium (Mg B_4 O_7:O_y) thermoluminescent phosphor is developed, containing boron, which boron 10 isotope has high cross section for thermal neutrons by ^{10} B $(n,\alpha)^7$ Li reaction. The nitric acid concentration, the number of washing for removing the excess of boric acid, the powder granulation of Mg B_4 O_7:O_y, the percentage of teflon used as binder and the reproducibility of thermoluminescent answer are also presented. (C.G.C.).

1628 (INIS-BR–3148, pp. 591-593) **Development of a calibration system for surface contamination monitors.** Marechal, M.H.H. (Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil)); Barbosa, M.P. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A calibration system for surface contamination monitors is developed, aiming supply the existence demand of these instruments. A experimental arrangement and a methodology are described. The advantages of use this system for calibration routine optimization are also discussed. (C.G.C.).

1629 (INIS-BR–3148, pp. 594-596) **Study of answer from different types of radioprotection instruments used in beta dosimetry.** Oliveira, A.H. (Minas Gerais Univ., Belo Horizonte, MG (Brazil). Dept. de Engenharia Nuclear); Mello, F.L.V. de; Ferreira, A.F.M. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo,

SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The answer of several radioprotection instruments is studied, in relation with the irradiation geometry and spectral distribution on energy. (C.G.C.).

1630 (INIS-BR–3148, pp. 598-600) **Angular and energetic dependence of portable detectors in beta radiation fields.** Levit, M.I. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Caldas, L.V.E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The result of a systematic study from three beta-gamma monitoring portable detectors (Type Geiger-Mueller, portable ionization chamber and pocket ionization chamber) in beta fields with different geometric configuration is presented. The energetic dependence for frontal radiation of the same radiation detectors is also studied. (C.G.C.).

1631 (INIS-BR–3148, pp. 601-604) **Determination of alternative conditions for instruments calibration with beta radiation.** Rocha, F.D.G. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Caldas, L.V.E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The influence of homogenization filter in the determination of chamber calibration factors and transmission factors of beta radiation in air, for obtaining different alternative conditions for beta-gamma portable monitors calibration was studied, using an extrapolation chamber and the beta secondary system at IPEN-CNEN-Brazil. (C.G.C.).

1632 (INIS-BR–3148, pp. 605-607) **Response variation of parallel plates chambers with the diameter of x-radiation field (30 kV).** Santos, W.M. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Caldas, L.V.E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The responses of ionization chambers of parallel plates, in relation to field diameter are verified, aiming to present an acceptable behaviour in comparison with a disposable commercial chamber, already used in radiotherapy. (C.G.C.).

1633 (INIS-BR–3148, pp. 608-611) **Quality control of calibration system for area monitors at National Laboratory of Metrology from Ionizing Radiations (LNMRI).** Ramos, M.M.O. (Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil)); Freitas, L.C. de. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The quality control of equipment used in calibration from the National Laboratory of Metrology on Ionizing Radiations is presented, with results of standard measure systems and irradiation system. Tables and graphics with the quality of systems are also shown. (C.G.C.).

1634 (INIS-BR–3148, pp. 612-614) **Calibration data survey of clinical dosemeters at IPEN from 1987 to 1991.** Albuquerque, M.P.P. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Caldas, L.V.E. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

An analysis of calibration factors from clinical dosemeters calibrated at IPEN in the last five years is studied, including stability at short and long date, maintenance of calibration factors and regularity on clinical dosemeters sending for recalibration. (C.G.C.).

1635 (INIS-BR–3148, pp. 615-618) **Quality control of secondary standards and calibration systems, therapy level, of National Laboratory of Metrology from Ionizing Radiations (LNMRI).** Cecatti, E.R. (Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil)); Freitas, L.C. de. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The results of quality control program of secondary standards, therapy level, and the calibration system of clinical dosemeters were analysed from 1984, when a change in the laboratory installation occurred and new standards were obtained. The national and the international intercomparisons were emphasised. The results for graphite wall chambers were compared, observing a maximum

variation of about 0,6%. In the case of Delrin (TK01) wall chambers, the maximum variation was 1,7%. The results of post intercomparisons with thermoluminescent dosemeters have presented derivations lesser than 1%, securing the standards consistence at LNMRI with the international metrological system. (C.G.C.).

1636 (INIS-BR–3148, pp. 619-621) **Influence of lucite phantoms on calibration of dosimetric pens.** Oliveira, E.C. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Xavier, M.; Caldas, L.E.V. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Dosimetrical pens were studied for the answer repetition and were tested in gamma radiation fields (^{60} Co and ^{137} Cs) in air and in front of a lucite phantom, obtaining a backscattering contribution. The medium backscattering factors were 1,053 and 1,108 for respectively ^{60} Co and ^{137} Cs. The pens were placed behind the phantom for verifying the radiation attenuation. (C.G.C.).

1637 (INIS-BR–3148, pp. 626-629) **Use of microdosimetric techniques related to cancer therapy with high energy protons.** Aro, A.C.A. (Instituto de Engenharia Nuclear (IEN), Rio de Janeiro, RJ (Brazil)). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Some details of plane microdosimetric detector developed for using on charged particle beams are presented, with a series of measures made by this detectors and comparisons with equivalent measures using a dosemeter of silicon diodes. (C.G.C.).

1638 (INIS-BR–3174, pp. 1-7) **Detection of alpha particles and Cf-252 fission fragments with solid track detectors and surface barrier detector. Efficiency calculation.** Khouri, M.T.F.C.; Koskinas, M.F.; Andrade, C. de; Vilela, E.C.; Hinostroza, H.; Kaschiny, J.E.A.; Costa, M.S. da; Rizzo, P.; Santos, W.M.S. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

A technique for particle detection by using track solid detector and also types of revealing and result analysis are presented concerned to Cf-252 fission fragments detection. Measurements of alpha particles detection efficiency using Makrofol E and surface barrier detector are performed. (L.C.J.A.).

1639 (INIS-mf–13721) **Nuclear reaction of ^{10} B (n, α) ^{7} Li and grain size effects on the production of free radicals in alanine.** Zurita Petatan, S.L. Universidad Autonoma del Estado de Mexico, Toluca (Mexico). Facultad de Quimica. 1993. 65p. (In Spanish). Order Number DE94606011. Source: OSTI; NTIS (US Sales Only); INIS.

In general, it is important to know the physical and chemical properties of any material that is exposed to ionizing radiation. In particular, in dosimetric work, the amount of the absorbed doses by these materials is of much interest, in such a way that several methods have been developed in the past. An important and quantitatively accessible radiation effect in organic substances is the production of free radicals that can be easily measured by 'ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY (EPR)'. Numerous studies have been now been made on pure D L-Alanine irradiated with different radiation sources. Examination of the irradiated samples reveals the production of a stable free radical (CH_3 - CH. -COOH). In particular, gamma and electron irradiated D L-Alanine has received wide attention in the high doses interval (10 - 10^5 Gy). In contrast, there are very few EPR studies on thermal neutron radiation induced free radicals in pure D L-alanine. This may be due to the weak EPR signals observed in the irradiated samples. The objective of this work is to study for the first time the increase of the radical yield produced in neutron irradiated borated alanine by the EPR technique. For this purpose alanine has been mixed with borax in different stoichiometric proportions and grain sizes. When the mixture is neutron irradiated, the boron of the borax may experience a neutron capture reaction, ^{10} B (n, α) ^{7} Li. With this nuclear reaction it is supposed that the α particles will may impinge on the alanine molecules, producing in this way extra free radicals. Samples were irradiated in the thermal column of a Triga Mark III nuclear reactor with a thermal neutron flux of 5 x 10 ^{7} n/Cm^2 -s. A signal enhancement of up to 1260 % is observed when samples of alanine-borax were intimately mixed in a stoichiometric ratio of 1:1.

1640 (INIS-mf–13731) **16. international conference on nuclear tracks in solids: abstracts.** Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

16th International Conference on Nuclear Tracks in Solids was held on 7-11 September, 1992 in Beijing. The specialists discussed nuclear tracks formation, development and observation. The applications of nuclear tracks technique in the fields of nuclear physics, life science, geoscience and environment monitoring were discussed at the meeting. More than 300 papers were contributed to the meeting.

1641 (INIS-mf–13731, pp. 5) **Advances in solid state nuclear track detectors.** Price, P.B. (California Univ., Berkeley, CA (United States). Dept. of Physics). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/uses; USES; ETCHING; MICROSCOPES; PARTICLE TRACKS; PHOSPHATE GLASS; POLYMERS

1642 (INIS-mf–13731, pp. 6) **Theory of latent radiation damage in polymers.** Chadderton, L.T. (Division of applied Physics, CSIRO Inst. of Industrial Technologies, Canberra, (Australia)); Cruz, S.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/polymers; POLYMERS/chemical radiation effects; BUILDUP; CHEMICAL BONDS; POLYMERS; EQUATIONS; ION IMPLANTATION; IONIZATION; LATENT IMAGES; NUCLEAR CASCADES; STOPPING POWER

1643 (INIS-mf–13731, pp. 6) **Hollow tracks of heavy ions in Ag(Cd)-detectors: Contribution to the radial profile of the action of charged particles in solids.** Schopper, E. (Frankfurt Univ. (Germany)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in*

solids: abstracts. Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/silver chlorides; CHARGE STATES; DENSITY; DISTRIBUTION; HEAVY IONS; OPACITY; RADIATION DETECTORS

1644 (INIS-mf–13731, pp. 8) **Particle penetration through frozen gases.** Schosnig, M. (Johann Wolfgang Goethe Univ., Frankfurt (Germany). Inst. fur Kernphysik); Rothard, H.; Kroneberger, K.; Schloesser, D.; Groeneveld, K.O. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/gases; ELECTRON EMISSION; ENERGY DEPENDENCE; ENERGY DEPOSITION; GAS COOLING; GASES; PHASE TRANSFORMATIONS; SECONDARY EMISSION; SOLIDIFICATION

1645 (INIS-mf–13731, pp. 9) **Track formation by release of lattice energy in mica.** Russell, F.M. (Rotherford Appleton Lab., Didcot, Oxon, (United Kingdom)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CRYSTAL LATTICES/energy losses; CRYSTAL LATTICES/muscovite; PARTICLE TRACKS/muscovite; MUSCOVITE; DISPERSION RELATIONS; ELECTRON DIFFRACTION; ENERGY DEPOSITION; IONIZATION; OPTICAL MICROSCOPY; PHASE TRANSFORMATIONS

1646 (INIS-mf–13731, pp. 11) **Digital- controlled measurement and three-dimensional reconstruction of particle tracks in emulsion chamber of CERN/EMU01 experiment.** Cai Xu (Hwazhong Normal Univ., Wuhan (China). Inst. of ParticlePhysics). EMU01 collaborated. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR EMULSIONS/counting techniques; NUCLEAR EMULSIONS/images; CERN; CHARGED PARTICLES; DIGITAL SYSTEMS; GOLD; HEAVY ION REACTIONS; LEAD; MULTIPLICITY; IMAGES; PARTICLE TRACKS; RESOLUTION; SILVER

1647 (INIS-mf–13731, pp. 12) **Studies on the fission of heavy ions and evaporation of alpha particles using nuclear track detectors.** Dwivedi, K.K. (North-Eastern Hill Univ., Shillong (India). Dept. of Chemistry); Raju, J.; Vater, P.; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA PARTICLES/dielectric track detectors; ALPHA PARTICLES/evaporation model; QUASI-FISSION/dielectric track detectors; ETCHING; FOUR-PI COUNTING; N CODES; POLYMERS; QUASI-FISSION; U CODES

1648 (INIS-mf–13731, pp. 14) **Etched track detectors in solar neutrino experiments.** Ilic, R. (Univ. of Ljubljana, (Slovenia)); Sutej, T.; Krcmar, M.; Ljubicic, A.; Kaucic, S.; Fujii, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/solar neutrinos; ETCHING; GEOLOGIC DEPOSITS; LEAD 205; PARTICLE TRACKS; RADON; THALLIUM 205 TARGET

1649 (INIS-mf–13731, pp. 22) **Angular dependence of proton response in CR-39 track detector.** Oda, K. (Kobe Univ. of Mercantile Marine (Japan)); Yamauchi, T.; Miyake, H.; Csige, I.; Benton, V. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/incidence angle; ETCHING; PROTONS; RESPONSE FUNCTIONS

1650 (INIS-mf–13731, pp. 23) **Prospects of making a multi-element photographic spectrometer - detector.** Rusov, V.D. (Odessa State Univ. (Ukranie)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SPECTROMETERS/photographic emulsions; CRYSTALS; NUCLEAR EMULSIONS; RADIATION DETECTORS; SPECTROMETERS; SYNERGISM

1651 (INIS-mf–13731, pp. 25) **Identification of recoil particles using track-coincidence and multiple track etching method.** Csige, I. (San Francisco Univ., CA (United States). Dept. of Physics); Oda, K.; Henke, R.P.; Benton, E.V. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/particle identification; COINCIDENCE METHODS; ETCHING; PARTICLE TRACKS; RANGE; RECOILS

1652 (INIS-mf–13731, pp. 29) **Application of SSNTD in Nuclear Physics.** Debeauvais, M. (Centre de Recherches Nucleaires, Strasbourg (France)); Ralarosy, J.; Zamani, M.; Jokic, S.; Fernandez, F. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/nuclear physics; CALIBRATION; ETCHING; NUCLEAR FRAGMENTS; USES

1653 (INIS-mf–13731, pp. 34) **The first national intercomparison of radon integrating detectors in radon chamber.** Zhou Jianliang (Uranium Mining Research Inst. Henyang (China)); Li Xianjie; Qiu Shoukang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EMANOMETERS/interlaboratory comparisons; EMANOMETERS/radon; CALIBRATION; CHINA; EMANOMETERS; RADON

1654 (INIS-mf–13731, pp. 41) **The importance of track detectors in radiation protection dosimetry.** Tommasino, L. (ENEA/DISP Divisione Metodologie e Misure - VIA V. Brancati, Roma (Italy)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSIMETRY/dielectric track detectors; RADIATION PROTECTION/dosimetry; DOSIMETRY; SENSITIVITY; USES

1655 (INIS-mf–13731, pp. 42) **Latest development of nuclear track study in China Institute of Atomic Energy.** Guo Shilun (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/research programs; BUBBLE CHAMBERS; CHINA; FISSION FRAGMENTS; HEAVY ION REACTIONS; NEUTRON DETECTION; NUCLEAR REACTION KINETICS

1656 (INIS-mf–13731, pp. 45) **Alpha particle radiography of small insects.** Su Chingshen. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IMAGES/alpha particles; INSECTS/images; INSECTS/biomedical radiography; CURIUM 244; DIELECTRIC TRACK DETECTORS; DISTANCE; IMAGES; INSECTS; MEV RANGE 01-10

1657 (INIS-mf–13731, pp. 48) **A TLD reader based on single-chip microprocessor.** Wang Jiaqi (Research Inst. of Chemical Defence, Beijing (China)); Wu Furong; Zhao Jianxing; Li Yuanfang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMOLUMINESCENT DOSEMETERS/microprocessors; THERMOLUMINESCENT DOSEMETERS/readout systems; TEMPERATURE CONTROL; TEMPERATURE DEPENDENCE; MICROPROCESSORS

1658 (INIS-mf–13731, pp. 49) **A wide range neutron dosemeter based on CR-39 track detectors.** Luszik-bhadra, M. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany)); Alberts, W.G.; Dietz, E.; Guldbakke, S.; Kluge, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/dielectric track detectors; DOSEMETERS/neutron detection; DOSE-RESPONSE RELATIONSHIPS; DOSEMETERS; ENERGY DEPENDENCE; MODIFICATIONS

1659 (INIS-mf–13731, pp. 50) **Neutron dosimetry by means of chemically etched CR-39 material PATRAS.** Streubel, G. (Dresden Univ. of Technology, Inst. of Radiation Protection Physics (Germany)); Doeschel, B.; Hahn, T.; Hartmann, H.; Kadner, K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DOSIMETRY/dielectric track detectors; DOSE-RESPONSE RELATIONSHIPS; ENERGY DEPENDENCE; ERRORS; ETCHING; INCIDENCE ANGLE

1660 (INIS-mf–13731, pp. 51) **Research of reactor power measurement by SSNTD.** Shi Yongqian (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/power density; POWER DENSITY/reactors; FISSION TRACKS; REACTORS; POWER DISTRIBUTION

1661 (INIS-mf–13731, pp. 52) **Use of CR-39 track detector in personnel neutron dosimetry.** Mollah, A.S. (Institute of Nuclear Science and Technology, Savar, Dacca (Bangladesh)); Kasim, M.M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/neutron dosimetry; DIELECTRIC TRACK DETECTORS/personnel dosimetry; CALIBRATION; DOSEMETERS; RECOILS; SENSITIVITY; USES

1662 (INIS-mf–13731, pp. 56) **Calibration of the CR39 used in the macro-experiment.** Capiluppi, C. (Dipartimento di Fisica, v.Imerio, Bologna (Italy)); Dekhissi, H.; Giacomelli, G.; Predieri, F.; Spurio, M.; Patrizii, L.; Katsavounidis, E. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/calibration; CROSS SECTIONS; CALIBRATION; ELECTRIC CHARGES; SILICON 28; SULFUR 32

1663 (INIS-mf–13731, pp. 59) **Study of range-energy relation of ^{28}Si heavy ions in Tuffak polycarbonate track detector.** Han Wensheng (Beijing Univ. of Aeronautics and Astronautics (China)); Guo Shilun. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SILICON 28/dielectric track detectors; SILICON 28/range; ENERGY LOSSES; HEAVY IONS; RANGE

1664 (INIS-mf–13731, pp. 64) **Prospecting petroleum or natural gas reservoirs with CR-39.** Lu Zuhui (Fundamental and applied Science Research Inst. of Henan, Zhengzhou Univ. (China)); Wang Yujin; Li Youming; Xu Aijun. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NATURAL GAS/prospecting; PETROLEUM/prospecting; PROSPECTING/dielectric track detectors; PROSPECTING; PETROLEUM; RADON; RESERVES; SOILS

1665 (INIS-mf–13731, pp. 66) **Nuclear track detectors for radon monitoring in coal mines in Kouzbass Siberian region (Russian Confederation).** Klein, D. (Laboratoire de Metrologie des Interfaces Techniques, Univ. de Franche Comte, Befort (France)); Chambaudet, A.; Roudko, N.; Malakhov, S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radiation monitoring; RADON/mines; COAL; RADIATION PROTECTION; RADON; MINES; USSR

1666 (INIS-mf–13731, pp. 75) **New results on the description of the etching process in polymers irradiated with heavy ions and the systematics of pore opening with the help of the model of low-energy excitations.** Danziger, M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear

Reactions). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYMERS/etching; POLYMERS/irradiation; EXCITATION; HEAVY IONS; MATHEMATICAL MODELS; OPENINGS; PARTICLE TRACKS; POLYMERS; ETCHING; IRRADIATION

1667 (INIS-mf–13731, pp. 77) **Detection threshold.** Bernaola, O.A. (National Atomic Energy Comission, Bs.As. (Antigua and Barbuda)); Saint Martin, G.; Grasso, J.C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/sensitivity; DIELECTRIC TRACK DETECTORS/threshold energy; DEUTERONS; SENSITIVITY; HELIUM; LITHIUM; PROTONS; THRESHOLD DETECTORS

1668 (INIS-mf–13731, pp. 78) **Study of latent heavy ion tracks in SSNTD by small-angle neutron scattering.** Birkholz, W. (Technische Hochschule Leipzig (Germany)); Haeussler, F.; Perelygin, V.P.; Stetsenko, S.G.; Vater, P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/particle tracks; PARTICLE TRACKS/heavy ions; PARTICLE TRACKS/latent images; ANNEALING; ENERGY DEPENDENCE; NEUTRONS; SMALL ANGLE SCATTERING

1669 (INIS-mf–13731, pp. 91) **Effect of CO_2 pulsed laser on the registration properties of nuclear tracks of CR-39.** Abu-Jarad, F. (Energy Research Lab./Research Inst., King Fahd Univ. of Petroleum and Minerals, Dhahran (Saudi Arabia)); Durrani, S.M.A.; Islam, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/carbon dioxide lasers; PARTICLE TRACKS/dielectric track detectors; ALPHA PARTICLES; ENERGY DEPENDENCE; FISSION FRAGMENTS; PULSED IRRADIATION

1670 (INIS-mf–13731, pp. 92-93) **Application and evaluation of solid state nuclear track detectors for radon measurement.** Feng Yushui (Lab. of Industrial Hygiene, Ministry of Public Health, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/comparative evaluations; DIELECTRIC TRACK DETECTORS/uses; CALIBRATION; USES; ETCHING; RADON; SENSITIVITY; THERMAL SPRINGS

1671 (INIS-mf–13731, pp. 94) **The relation between the track etch density and the radon concentration.** Lu Cunheng (East China College of Geology, Hengyang (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/concentration ratio; RADON/particle tracks; DENSITY; ETCHING; MATHEMATICAL MODELS; RADON

1672 (INIS-mf–13731, pp. 97) **CR-39 and LR-115 as a secondary standard dosemeter for radon dose calibration.** Kenawy, M.A. (Ain Shams Univ., Cairo (Egypt)); Eissa, H.M.; Sharaf, M.A.; El-Fiki, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radon; RADON/dosemeters; CALIBRATION; RADON; RADIATION DOSES; DOSEMETERS; SECONDARY EMISSION DETECTORS

1673 (INIS-mf–13731, pp. 103) **On the formation of nuclear tracks in plastic materials.** Enge, W. (Inst. fuer Reine una Angewandte Kernphysik, Christian-Albrechts- Univ. Kiel (Germany)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/organic polymers; DIELECTRIC TRACK DETECTORS; ELECTRIC CURRENTS; ELECTROLYSIS; ETCHING; HEAVY IONS

1674 (INIS-mf–13731, pp. 104) **Discovery of some phenomena in polycarbonate detectors by the introduction of a new triplet ECE technique.** Sohrabi, M. (Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Radiation Protection Dept.); Sadeghi, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/polycarbonates; ETCHING/electrochemistry; ETCHING/polycarbonates; POLYCARBONATES; ETCHING; ELECTROCHEMISTRY; MEV RANGE 01-10; PARTICLE TRACKS

1675 (INIS-mf–13731, pp. 105) **Track treeing mechanism and its application.** Li Boyang (Chinese Nuclear Society, Beijing, BJ (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/electrochemistry; PARTICLE TRACKS/etching; CRACKS; FRACTURE PROPERTIES; MATHEMATICAL MODELS; ORGANIC POLYMERS; ELECTROCHEMISTRY; ETCHING; STRAINS; STRESSES; USES

1676 (INIS-mf–13731, pp. 113) **Development on the instrumentation for counting and analysis of particle tracks in solids.** Espinosa, G. (Inst. de Fisica, UNAM. (Mexico)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/counting techniques; PARTICLE TRACKS/measuring instruments; DIELECTRIC TRACK DETECTORS; ETCHING; SOLIDS

1677 (INIS-mf–13731, pp. 116) **Effects of atomic hydrogen on polymeric track detectors.** Apel, P. Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Kuznetsov, V.I.; Luppov, V.G.; Levkovich, A.V.; Altynov, V.A.; Orelovich, O.L. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear

tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/hydrogen; DIELECTRIC TRACK DETECTORS/polymers; CHEMICAL REACTIONS; HYDROGEN; POLYMERS; ETCHING; PARTICLE TRACKS; XENON IONS

1678 (INIS-mf–13731, pp. 117-118) **Response of sensitive solid state track detectors region as a visualization result of some part of its physical states.** Ditlov, V. (Inst. of Chemicophotography Industry, Moscow (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/sensitivity; SENSITIVITY; PHYSICAL PROPERTIES; PROBABILISTIC ESTIMATION; RESPONSE FUNCTIONS; TIME DEPENDENCE; VECTORS

1679 (INIS-mf–13731, pp. 119) **Effects of gamma irradiation on the bulk and track etching properties of celiulose nitrate (Daicel 6000) and CR-39 plastics.** Shweikani, R. (School of Physics and Space Research, Univ. of Birmingham, Birmingham (United Kingdom)); Durrani, S.A.; Tsuruta, T. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/radiation effects; CELLULOSE; ETCHING; GAMMA RADIATION; NITRATES

1680 (INIS-mf–13731, pp. 120) **A quick DYECET method of ECE tracks in polymeric detectors.** Sohrabi, M. (National Radiation Protection Dept., Atomic Energy Organization of Iran , Tehran (Iran, Islamic Republic of)); Mahdi, Sh. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; ETCHING/coloration; ALPHA PARTICLES; ETCHING; DYES; ELECTROCHEMISTRY; COLORATION; PARTICLE TRACKS; POLYMERS; RECOILS

1681 (INIS-mf–13731, pp. 121) **V_T(track etch rate): reflection of total energy-loss rate (dE/dX) for ^{238}U in CR-39.** Raju, J. (Dept. of Chemistry, North-Eastern Hill Univ., Shillong (India)); Dwivedi, K.K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; ENERGY LOSSES/uranium ions; ETCHING/energy losses; CALIBRATION; CORRELATIONS; ETCHING; URANIUM 238

1682 (INIS-mf–13731, pp. 122) **Statistics and error considerations at the application of SSNTD-technique in radon measurement.** Joensson, G. (Dept. of Physics, Univ. of Lund (Sweden)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/errors; DIELECTRIC TRACK DETECTORS/statistics; RADON/dielectric track detectors; ERRORS; STATISTICS; ETCHING; PARTICLE TRACKS; RADIATION DETECTION; RADON; RELIABILITY

1683 (INIS-mf–13731, pp. 123) **Pre-soak studies with CR-39 and lexan.** Pollock, R.W. (Radon Environmental Monitoring, Northbrook (United States)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/sensitivity; ORGANIC POLYMERS/dielectric track detectors; ORGANIC POLYMERS/etching; SENSITIVITY; ETCHING; PARTICLE TRACKS; WATER

1684 (INIS-mf–13731, pp. 127) **CR-39 Rn-222 detectors.** Shang Bing (Lab. of Industrial Hygiene, Ministry of Public Health, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radon 222; AIR; ALPHA DETECTION; CALIBRATION; CONCENTRATION RATIO; DATA COVARIANCES; LIMITING VALUES; MICROSCOPES; PARTICLE TRACKS

1685 (INIS-mf–13731, pp. 136) **Nuclear emulsion in China.** Sun Hancheng (Chhina Inst. of Atomic Energy, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR EMULSIONS/ciae; HISTORICAL ASPECTS; CIAE; REVIEWS; USES

1686 (INIS-mf–13731, pp. 137) **Ageing effects on a new polymeric track detector SR-90 and a model of the nuclear track formation.** Fujii, M. (Aomori Univ., the Faculty of Engineering, Aomori (Japan)); Yokota, R.; Kobayashi, T.; Hasegawa, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/aging; DIELECTRIC TRACK DETECTORS/polymers; PARTICLE TRACKS/dielectric track detectors; AGING; POLYMERS; MOLECULAR STRUCTURE; RADICALS; SENSITIVITY

1687 (INIS-mf–13731, pp. 138) **A new apparatus for track-analysis in nuclear track emulsion based on a CCD-camera device.** Ganssauge, E. (F.B. Physik, Philipps Univ., Marburg (Germany)); Mangotra, L.; Ochs, M.; Roper, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CAMERAS/nuclear emulsions; NUCLEAR EMULSIONS/image processing; CAMERAS; PARTICLE TRACKS; SPATIAL RESOLUTION; USES

1688 (INIS-mf–13731, pp. 143) **Stopping power and range determination of relativistic and non-relativistic heavy ions in different materials including solid nuclear track detectors.** Sharma, S.K. (Dept. of Physics, Kurukshetra Univ., Kurukshetra (India)); Shyam Kumar; Sharma, A.P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/heavy ions; HEAVY IONS/range; HEAVY IONS/stopping power; COMPARATIVE EVALUATIONS; ENERGY RANGE; RANGE; MATERIALS

1689 (INIS-mf–13731, pp. 144) **Effect of reactor irradiation and kinetics of fission track formation in high purity quartz glass.** Medeiros, J.A. (Chemistry Dept., Catholic Univ. (Brazil)); Moraes, O.M.G. de. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/glass; DIELECTRIC TRACK DETECTORS/radiation effects; FISSION TRACKS/dielectric track detectors; GLASS; IRRADIATION; KINETICS; QUARTZ; REACTORS

1690 (INIS-mf–13731, pp. 145) **Reactor irradiation effects and kinetics of fission track formation on 'CR-39' cross-linked polycarbonate.** Zylberberg, H. (Inst. of Nuclear Engineering, Atomic Energy Commission (Brazil)); Medeiros, J.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/polycarbonates; DIELECTRIC TRACK DETECTORS/radiation effects; FISSION TRACKS/dielectric track detectors; CROSS-LINKING; POLYCARBONATES; IRRADIATION; KINETICS; REACTORS

1691 (INIS-mf–13731, pp. 146) **AgCl (Cd) detectors prepared by pressing.** Bradnova, V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Kulikova, S.I.; Nevzorova, N.M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SILVER CHLORIDES/pressing; SILVER CHLORIDES/radiation detectors; ALPHA PARTICLES; CADMIUM; DOPED MATERIALS; PRESSING

1692 (INIS-mf–13731, pp. 147) **An automated system for track measurement for the employment of CR-39 as alpha-spectrometer in radon and daughters monitoring.** Hadler N., J.C. (Dept. de Raios Cosmicos e Cronologia, IFGW, Univ. Estadual de Campinas (Brazil)); Iunes, P.J.; Paulo, S.R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/image processing; RADON/particle tracks; ALPHA SPECTROMETERS; AUTOMATION; DAUGHTER PRODUCTS; DENSITOMETERS; DIELECTRIC TRACK DETECTORS; RADON

1693 (INIS-mf–13731, pp. 149) **CR-39 imaged by atomic force microscope.** Vukovic, J.B. (Inst. of Biophysics, Faculty of Medicine (Yugoslavia)); Antanasijevic, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/images; DIELECTRIC TRACK DETECTORS/microscopes; ATOMIC DISPLACEMENTS; IMAGES; MICROSCOPES; IMAGE SCANNERS

1694 (INIS-mf–13731, pp. 151) **Self consistent method of energy determination for high energy γ-quanta by densitometer measurements in x-ray emulsion chamber.** Normuratov, F. (Inst. of Physics and Engineering, Dushanbe (USSR)); Zhdanov, G.B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ENERGY/algorithms; GAMMA RADIATION/energy; GAMMA RADIATION/quantization; NUCLEAR EMULSIONS/densitometers; CASCADE SHOWERS; ENERGY; ALGORITHMS; QUANTIZATION; DENSITOMETERS; TEV RANGE; X RADIATION

1695 (INIS-mf–13731, pp. 153) **Nuclear emulsion and plastic track detectors applied to high energy physic: hybrid experiments in the past and present decade.** Rosa, G. (Dipartimento di Fisica and Sez. I.N.F.N., Univerista' La Sapienza, Rome (Italy)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/high energy physics; NUCLEAR EMULSIONS/high energy physics; ORGANIC POLYMERS; SPATIAL RESOLUTION; USES

1696 (INIS-mf–13731, pp. 172) **Standard radon calibration chamber using SSNTDS.** El-Fiki, M.A. (National Inst. of Standards, Cairo (Egypt)); Eissa, H.M.; Sharaf, M.A.; Abdel Hady, M.L.; Kenawy, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/calibration; RADON/samplers; CALIBRATION STANDARDS; DIELECTRIC TRACK DETECTORS; EMANOMETERS; RADON; CALIBRATION; SAMPLERS

1697 (INIS-mf–13731, pp. 179) **Passive radon personal dosemeter.** Djeffal, S. (Lab. de Dosimetrie, Centre de Radioprotection et de Surete, Alger (Algeria)); Allab, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/personnel dosimetry; RADON/dosemeters; CALIBRATION; DIELECTRIC TRACK DETECTORS; DIFFUSION; DIFFUSION CHAMBERS; DOSEMETERS; OPTIMIZATION; POLYETHYLENES; RADON; SENSITIVITY

1698 (INIS-mf–13731, pp. 181) **Theoretical determination of calibration coefficient for radon measurements with CR 39.** Nikezic, D. (Faculty of Natural Sciences, Physics Dept. (Yugoslavia)); Krstic, D.; Markovic, P.; Jovanovic, B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/calibration; DIELECTRIC TRACK DETECTORS/radon; AIR; CONCENTRATION RATIO; CALIBRATION; RADON; ETCHING; MATHEMATICAL MODELS; MONTE CARLO METHOD; RADIATION DETECTION; STOPPING POWER

1699 (INIS-mf–13731, pp. 188) **Fast neutron energy and angle response of electrochemically etched CR-39 plastic detectors.** Fernandez, F. (Fisica de les Radiacions, Dept. de Fisica, Univ. Autonoma de Barcelona, Barcelona (Spain)); Domingo, C.; Tayeb, B.; Luguera, E.; Baixeras, C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/neutron detection; DIELECTRIC TRACK DETECTORS/response functions; ELECTROCHEMISTRY; ENERGY DEPENDENCE; ETCHING; FAST NEUTRONS; INCIDENCE ANGLE; MONTE CARLO METHOD; ORGANIC POLYMERS

1700 (INIS-mf–13731, pp. 189) **Calibration of various types of CR-39-based neutron dosimeters in a heavy water moderated and monoenergetic neutron fields. Pt. 2: Experimental.** Matiullah (Cente for Nuclear Studies, Nilore, Islamabad (Pakistan)); Kudo, K.; Yang, X. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/dosemeters; DOSEMETERS/calibration; DOSEMETERS/neutron detection; CALIFORNIUM 252; DOSEMETERS; CALIBRATION; HEAVY WATER; NEUTRON SOURCES

1701 (INIS-mf–13731, pp. 193) **On the impact of nuclear track science for recording the effects of radioactive environmental interactions in biology.** Madhuri Sharma (D.S. Postgraduate Coll., (Agra Univ.), Aligarh (India)); Maurya, A.N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/biological radiation effects; DIELECTRIC TRACK DETECTORS/environmental impacts; ANIMALS; FALLOUT; HEAVY IONS; PARTICLE TRACKS; PLANTS

1702 (INIS-mf–13731, pp. 194) **Quantitative neutron activation autoradiography of exogenous ^{6}Li in rat tissues by SSNTD.** Zaichick, V.Y. (Inst. of Medical Radiology, Obninsk (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/dielectric track detectors; AUTORADIOGRAPHY/rats; AUTORADIOGRAPHY; RATS; LITHIUM 6; NEUTRON ACTIVATION ANALYSIS; TISSUES

1703 (INIS-mf–13731, pp. 201) **The physical characteristics of the TLD-LiF dosemeters.** Akbari, R.B. (Tehran Univ., Science Faculty, Phys. Dept., Tehran (Iran, Islamic Republic of)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMOLUMINESCENT DOSEMETERS/lithium fluorides; THERMOLUMINESCENT DOSEMETERS/physical properties; BUILDUP; DOSE-RESPONSE RELATIONSHIPS; GLOW CURVE; RADIATION DOSES

1704 (INIS-mf–13731, pp. 211) **Submicroscopic nuclear track kinetic theory and the charge changing process.** Mazzei, R. (Dept. de Radiobiologia, Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/kinetics; ELECTRIC CHARGES; ETCHING; IONS; MICROSCOPY; KINETICS

1705 (INIS-mf–13731, pp. 214) **Registration threshold for tracks of ^{40}Ar ions in muscovite mica.** Dwivedi, K.K. (Dept. of Chemistry, North-Eastern Hill Univ., Shillong (India)); Ghosh, S.; Raju, J. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MUSCOVITE/particle tracks; PARTICLE TRACKS/argon 40; PARTICLE TRACKS/threshold energy; ARGON IONS; DIELECTRIC TRACK DETECTORS; ETCHING; MUSCOVITE

1706 (INIS-mf–13731, pp. 216) **Track lengths of 11.4 MeV/u ^{20}Ne ions in CR-39.** Kocsis, Zs. (Dept. of Physics, Univ. of Veszprem, Veszprem (Hungary)); Dwivedi, K.K.; Vater, P.; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/length; PARTICLE TRACKS/neon ions; DIELECTRIC TRACK DETECTORS; ENERGY DEPENDENCE; ETCHING; MEV RANGE 100-1000; NEON 20; LENGTH

1707 (INIS-mf–13731, pp. 217) **Response of soda glass detector to intermediate energy heavy ions.** Sharma, S.K. (Dept. of Physics, Kurukshetra Univ., Kurukshetra (India)); Kumar, S.; Yadav, J.S.; Sharma, A.P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RESPONSE FUNCTIONS/glass; RESPONSE FUNCTIONS/heavy ions; DIELECTRIC TRACK DETECTORS; IRON 56; RANGE; GLASS; SODIUM CARBONATES; URANIUM 238

1708 (INIS-mf–13731, pp. 218) **The nucleation and growing of AgBr microcrystals as a function for making the sensitivity centers and the latent images centers produced by ionizing particles.** Zizic, B. (Faculty of Physics, Belgrade, Studentski (Yugoslavia)); Mijic, M.; Vukovic, J.B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IONIZATION/latent images; IONIZATION/sensitivity; SILVER BROMIDES/crystal growth; SILVER BROMIDES/nucleation; DIELECTRIC TRACK DETECTORS; IONIZATION; SENSITIVITY; NUCLEAR EMULSIONS; NUCLEATION

1709 (INIS-mf–13731, pp. 221) **Heavy ion response of SR-90 and CR-39 track detectors.** Csige, I. (Physics Dept., Univ. of San Francisco, San Francisco (United States)); Benton, E.R.; Benton, E.V.; Fujii, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/heavy ions; DIELECTRIC TRACK DETECTORS/response functions; ETCHING; ORGANIC POLYMERS; SENSITIVITY

1710 (INIS-mf–13731, pp. 222) **Heavy ion ranges in glass detectors.** Virk, H.S. (Physics Dept., Guru Nanak Dev Univ. (India)); Kaur, R.; Singh, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/glass; DIELECTRIC TRACK DETECTORS/heavy ions; HEAVY IONS/range; GLASS; ETCHING; GOLD 197 BEAMS; RANGE; IRON 56

BEAMS; SENSITIVITY; TITANIUM 48 BEAMS; URANIUM 238 BEAMS; XENON 131 BEAMS

1711 (INIS-mf–13731, pp. 223) **Comparison between SR-90 and CR-39.** Abu-Jarad, F. (Energy Research Laboratory/Research Inst., King Fahd Univ. of Petroleum and Minerals, Dhahran (Saudi Arabia)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/comparative evaluations; DIELECTRIC TRACK DETECTORS/polymers; POLYMERS; ETCHING; SENSITIVITY; SURFACE PROPERTIES

1712 (INIS-mf–13731, pp. 224) **Proton response of CR-39 (PM-355).** Al-Jarallah, M.T. (Dept. of Physics, King Fahd Univ. of Petroleum and Minerals, Dhahran (Saudi Arabia)); Abu-jarad, F.; Hallak, A.B.; Coban, A.; Islam, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/protons; DIELECTRIC TRACK DETECTORS/response functions; PROTONS; EFFICIENCY; ENERGY DEPENDENCE; ETCHING; INCIDENCE ANGLE; MEV RANGE 01-10; SENSITIVITY

1713 (INIS-mf–13731, pp. 225) **Bulk etching rate of irradiated Lexan polycarbonate measuring fission track diameters.** Carvalho, M.L.C.P. (Analytical Chemistry Dept., Federal Univ. (Brazil)); Medeiros, J.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/polycarbonates; ETCHING; POLYCARBONATES; FISSION TRACKS; IRRADIATION; SIZE

1714 (INIS-mf–13731, pp. 226) **Reactor irradiation effects and kinetics of fission track formation on 'Bis-Phenol-A' polycarbonate.** Carvalho, M.L.C.P. (Analytical Chemistry Dept., Federal Univ. (Brazil)); Medeiros, J.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/polycarbonates; POLYCARBONATES/radiation effects; ANNEALING; EFFICIENCY; ETCHING; POLYCARBONATES; GAMMA RADIATION; IRRADIATION; PILE NEUTRONS

1715 (INIS-mf–13731, pp. 227) **Sensitivity study of hungarian made CR-39 for heavy ion tracks.** Kocsis, Zs. (Dept. of Physics, Univ. of Veszprem, Veszprem (Hungary)); Vater, P.; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/heavy ions; DIELECTRIC TRACK DETECTORS/hungary; BISMUTH 209; HUNGARY; ETCHING; GOLD 197; PARTICLE TRACKS; SENSITIVITY

1716 (INIS-mf–13731, pp. 228) **Low energy heavy ions registered in plastic films.** Joensson, G. (Dept. of Physics, Univ. of Lund, Lund (Sweden)); Hellborg, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC POLYMERS/films; ORGANIC POLYMERS/heavy ions; CHLORINE IONS; DIELECTRIC TRACK DETECTORS; MEV RANGE 01-10; FILMS; OXYGEN IONS; PARTICLE TRACKS; RESPONSE FUNCTIONS; SILVER IONS

1717 (INIS-mf–13731, pp. 229) **Heavy ion ranges in plastic track detectors.** Virk, H.S. (Physics Dept., Guru Nanak Dev Univ. (India)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY IONS/dielectric track detectors; HEAVY IONS/range; ETCHING; GEV RANGE 01-10; RANGE; LANTHANUM 139 BEAMS; LEAD 208 BEAMS; ORGANIC POLYMERS; URANIUM 238 BEAMS; XENON 132 BEAMS

1718 (INIS-mf–13731, pp. 230) **Optimization of dopants in CR-39.** Pang Deling (Inst. of Radiation Medicine, Shanghai Medical Univ., Shanghai (China)); Li Landi; Zhy Bing. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/crystal doping; DIELECTRIC TRACK DETECTORS/organic polymers; OPTIMIZATION; PERFORMANCE; RESPONSE FUNCTIONS; SENSITIVITY

1719 (INIS-mf–13731, pp. 231) **Application of CR-39 (DAP) detectors for alpha autoradiography of tissues.** Li Landi (Inst. of Radiation Medicine, Shanghai Medical Univ., Shanghai (China)); Pang Deling; Zhu Bing. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/tissues; DIELECTRIC TRACK DETECTORS/autoradiography; ALPHA DETECTION; AUTORADIOGRAPHY; TISSUES; ETCHING; MICE; ORGANIC POLYMERS; URANIUM 238; USES

1720 (INIS-mf–13731, pp. 235) **Presoaking-induced modifications of the etching process in CR-39.** Krueger, J. (Institut fuer Reine und Angewandte Kernphysik (Germany)); Enge, W. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; ETCHING/modifications; ARGON IONS; ETCHING; MODIFICATIONS; GOLD IONS; PARTICLE TRACKS

1721 (INIS-mf–13731, pp. 236) **Electrolytic Measurements on latent heavy ion tracks in plastic.** Petersen, F. (Institut fuer Reine und Angewandte Kernphysik (Germany)); Enge, W. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/electrolysis; PARTICLE TRACKS/heavy ions; ETCHING; LATENT IMAGES; ORGANIC POLYMERS; ELECTROLYSIS

1722 (INIS-mf–13731, pp. 238) **Shrimp shells as nuclear track detectors.** Espinosa, G. (Instituto de Fisica, Mexico, D.F. (Mexico)); Martinez, A.; Golzarri, J.I. Academia Sinica, Beijing, BJ

(China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/materials; SHRIMP/shells; CHEMICAL PREPARATION; CHITIN; MATERIALS; ETCHING; PERFORMANCE; POLYMERS; RESPONSE FUNCTIONS; SHRIMP; SHELLS

1723 (INIS-mf--13731, pp. 239) **Optimization of electrochemical track etching for alpha particle spectrometry.** Hassib, G.M. (The National Centre for Nuclear Safety and Radiation Control, Atomic Energy Authority, Cairo (Egypt)); Amer, H.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ETCHING/alpha spectroscopy; ETCHING/electrochemistry; EFFICIENCY; ENERGY RESOLUTION; ETCHING; ELECTROCHEMISTRY; MEV RANGE 01-10; OPTIMIZATION; PARTICLE TRACKS

1724 (INIS-mf--13731, pp. 240) **The sparkable region phenomena in electrochemical etching.** Hassib, G.M. (The National Center for Nnclear Safety and Radiation Control, Atomic Energy Authority, Cairo (Egypt)); Amer, H.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ETCHING/electric sparks; ETCHING/electrochemistry; ALPHA DETECTION; ENERGY LOSSES; ETCHING; ELECTROCHEMISTRY; POLYCARBONATES

1725 (INIS-mf--13731, pp. 241) **A new parameter in the ECE of polymer track detectors.** Sohrabi, M. (National Radiation Protection Dept., Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of)); Katouzi, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/polymers; ETCHING; POLYMERS; ELECTROCHEMISTRY; PARAMETRIC ANALYSIS

1726 (INIS-mf--13731, pp. 243) **Ageing, fading and background study of various nuclear track detectors.** Djeffal, S. (Laboratoire de Dosimetrie, Centre de Radioprotection et de Surete, Alger (Algeria)); Lounis, Z.; Allab, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/age estimation; DIELECTRIC TRACK DETECTORS/background noise; ANNEALING; CELLULOSE; MATERIALS; NITRATES

1727 (INIS-mf--13731, pp. 244) **Time evolution studies of polycarbonate response to fast ultra heavy ions.** Domingo, C. (Fisica de les Radiacions, Dept. de fisica, Univ. Autonoma de Barcelona (Spain)); Baixeras, C.; Fernandez, F. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYCARBONATES/heavy ions; POLYCARBONATES/response functions; GEV RANGE 100-1000; POLYCARBONATES; TIME DEPENDENCE; URANIUM IONS

1728 (INIS-mf--13731, pp. 245) **Electrochemical etching of CR-39 track detectors at room temperature.** Dajko, G. (Inst. of Nuclear Research of the Hung. Acad. of Sciences (Hungary)); Turek, K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; ELECTROCHEMISTRY/etching; ETCHING; ELECTROCHEMISTRY; SOLUTIONS; TEMPERATURE RANGE 0273-0400 K

1729 (INIS-mf--13731, pp. 246) **Registration temperature effect in polypropylene detectors.** Apel, P.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Didyk, A.Yu.; Kravets, L.I.; Kuznetsov, V.I.; Fursov, B.I. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/polypropylene; DIELECTRIC TRACK DETECTORS/temperature dependence; ANTIOXIDANTS; POLYPROPYLENE; ETCHING; FISSION FRAGMENTS; IRRADIATION; RELAXATION

1730 (INIS-mf--13731, pp. 247) **A study of characteristics of microstructures of U-238 in CR-39.** Singh, N.P. (Longowal Institute of Engineering and Technology (India)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/microstructure; URANIUM 238/dielectric track detectors; URANIUM 238/particle tracks; ASPECT RATIO; DEVELOPERS; ETCHING; METHANOL; MICROSTRUCTURE; RESOLUTION; URANIUM IONS

1731 (INIS-mf--13731, pp. 248) **Studies on latent image fading of nuclear emulsions.** Liu Yonglian (China Inst. of Atomic Energy (China)); Han Jinqin; Liu Huichang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR EMULSIONS/latent images; ADDITIVES; ASCORBIC ACID; SENSITIVITY; STABILITY; TEMPERATURE DEPENDENCE

1732 (INIS-mf--13731, pp. 249) **The etching characteristics of phosphate glass track detectors.** Wang Shicheng (Inst. of High Energy Physics, Beijing (China)); Price, P.B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/glass; ADDITIVES; ETCHING; GLASS; GOLD 197; HEAVY IONS; LANTHANUM 139; PHOSPHATES; SENSITIVITY; SOLUTIONS; URANIUM 238

1733 (INIS-mf--13731, pp. 253) **Submicroscopic observation of fission product tracks in MICA.** Meoli, P. (National Atomic Energy Comission (Argentina)); Mazzei, R.; Bernaola, O.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/mica; FISSION TRACKS/microscopy; CALIFORNIUM 252; ETCHING; FISSION PRODUCTS; MICA; MICROSCOPY; REPLICA TECHNIQUES

1734 (INIS-mf–13731, pp. 254) **Characterisation of nuclear track detector response by micro-topography observations and image analysis.** Chambaudet, A. (Laboratoire de Microanalyses Nucleaires, UFR des Sciences et Techniques, Univ. de Franche Comte (France)); Berger, F.; Dubois, C.; Klein, D.; Mathae, V. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/image processing; DIELECTRIC TRACK DETECTORS/response functions; COMPUTER CODES; PARTICLE TRACKS; TOPOGRAPHY

1735 (INIS-mf–13731, pp. 255) **Track counting by an image analysing system.** Birkholz, W. (Technische Hochschule Leipzig (Germany)); Baumbach, H.; Matz, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/particle tracks; PARTICLE TRACKS/counting techniques; PARTICLE TRACKS/image processing; CAMERAS; CONCENTRATION RATIO; MICROCOMPUTERS; MICROSCOPES; RADON

1736 (INIS-mf–13731, pp. 256) **Image processing techniques for SSNTDS measurements.** Sampsonidis, D. (Nuclear Physics Dept., Univ. of Thessaloniki (Greece)); Zamani, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/image processing; AUTOMATION; IMAGE SCANNERS; PARTICLE TRACKS

1737 (INIS-mf–13731, pp. 257) **A computerized spark counter.** Deng Xinlu (Dept. of Physics, Dalian Univ. of Technology (China)); Zhang Goubing; Zhang Liansheng. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SPARK COUNTERS/microcomputers; SPARK COUNTERS/particle tracks; COUNTING TECHNIQUES; MICROCOMPUTERS; URANIUM; WATER

1738 (INIS-mf–13731, pp. 258) **Tracks of swift heavy ions in silver halides, revealed by different methods.** Granzer, F. (Inst. fuer Angewandte Physik, Frankfurt (Germany)); Kronenberger, H.; Hahn, C.; Hegenbart, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/heavy ions; PARTICLE TRACKS/images; SILVER/halides; LATENT IMAGES; MICROSCOPY; IMAGES; SILVER; HALIDES

1739 (INIS-mf–13731, pp. 269) **Electron microscope autoradiography used for studying tritium formation and distribution in electrolytic deuterium treatment of palladium.** Rusov, V.D. (Odessa State Univ. (Ukranie)); Semenov, M.Yu.; Zelentsova, T.N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/electron microscopes; AUTORADIOGRAPHY/tritium; AUTORADIOGRAPHY; TRITIUM; DEUTERIUM; ELECTROLYSIS; PALLADIUM; PARTICLE PRODUCTION; SPATIAL DISTRIBUTION

1740 (INIS-mf–13731, pp. 287) **Characterization of polycarbonate as the solid state track recorder.** Hwang, S.D. (Institute of Nuclear Engineering, National Tsing Hua Univ., Hsinchu, Taiwan (China)); Tauzo, C.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYCARBONATES/dielectric track detectors; POLYCARBONATES/performance; ETCHING; FAST NEUTRONS; PARTICLE TRACKS; POLYCARBONATES; PERFORMANCE; RADIATION EFFECTS

1741 (INIS-mf–13731, pp. 288) **Some recent development of spectrophotometric measurement of high neutron doses.** Body, J.M. (CEA, DPHD/S-DOS, Centre d'Etudes, Fortenay (France)); Medioni, R.; Bouscayrol, H.; Portal, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SPECTROPHOTOMETRY/dielectric track detectors; SPECTROPHOTOMETRY/neutron dosimetry; ETCHING; OPACITY; SPECTROPHOTOMETRY; THRESHOLD DOSE

1742 (INIS-mf–13731, pp. 289) **Calibration of various types of CR-39-based neutron dosimeters in a heavy water moderated and monoenergetic neutron fields: Pt. 1: Theoretical.** Matiullan (Centre for Nuclear Studies, Islamabad (Pakistan)); Yang, X.; Kudo, K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/calibration; DIELECTRIC TRACK DETECTORS/neutron dosimetry; BACKSCATTERING; CALIFORNIUM 252; CALIBRATION; M CODES; NEUTRON SPECTRA

1743 (INIS-mf–13731, pp. 290) **Experience with γ and BD-100R neutron bubble detectors.** Matiullan (Center for Nuclear Studies, Islamabad (Pakistan)); Kudo, K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BUBBLE CHAMBERS/gamma detection; BUBBLE CHAMBERS/neutron detection; REVIEWS; SENSITIVITY; TEMPERATURE DEPENDENCE

1744 (INIS-mf–13731, pp. 291) **Reactor beam profile measurements with electrochemically etched track detectors.** Luszik-Bhadra, M. (Physikalisch Technische Bundesanstalt, Braunschweig (Germany)); Dietz, E. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/beam profiles; NEUTRON BEAMS/beam profiles; NEUTRON BEAMS/research reactors; ELECTROCHEMISTRY; ETCHING

1745 (INIS-mf–13731, pp. 292) **Effect of presence of gamma rays with neutron fields on the performance of a CR-39-based cubical neutron dosimeter.** Sofia Wijaya, D. (PPTN Batan, TI, Tamansari, Bandung (Indonesia)); Matiullah. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992.

383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/interference; DOSEMETERS/neutron detection; DIELECTRIC TRACK DETECTORS; DOSE-RESPONSE RELATIONSHIPS; DOSEMETERS; INTERFERENCE; ETCHING; GAMMA RADIATION; PERFORMANCE

1746 (INIS-mf–13731, pp. 293) **Reassessment of the CR-39 based cubical neutron dosimeter.** Sofia Wijaya, D. (PPTN Batan, TI, Tamansari, Bandung (Indonesia)); Matiullah. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/dielectric track detectors; DOSEMETERS/neutron detection; DOSE-RESPONSE RELATIONSHIPS; DOSEMETERS; EVALUATION; MODIFICATIONS

1747 (INIS-mf–13731, pp. 295) **A simple technique to discriminate various charged particles using SSNTDs.** Majeed, A. (Institute of Industrial Automation, Islamabad (Pakistan)); Ahmad, S.M.; Durrani, S.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/particle discrimination; CHARGED PARTICLES; ETCHING; NEUTRON THERAPY; PARTICLE TRACKS

1748 (INIS-mf–13731, pp. 296) **Energy response of electrochemically etched PADC at different angles.** Azimi-Garakani, D. (Radiation Hygiene Division, Paul Scherrer Inst. (Switzerland)); Wernli, C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/energy dependence; CARBONATES; ELECTROCHEMISTRY; ETCHING; INCIDENCE ANGLE

1749 (INIS-mf–13731, pp. 297) **Thermal neutron dosimetry with SSNTD.** Zaichick, V.Ye. (Inst. of Medical Radiology, Obninsk (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DOSIMETRY/dielectric track detectors; NEUTRON DOSIMETRY/thermal neutrons; ALPHA PARTICLES; NITROCELLULOSE

1750 (INIS-mf–13731, pp. 298) **A long-term study of CR-39 detectors for neutron dosimetry.** Tommasino, L. (Divisione Metodologie e Misure, Rome (Italy)); Torri, G.; Cavaioli, M.; Riccardi, M.; Giap, T. van. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/neutron dosimetry; BACKGROUND NOISE; DOSE-RESPONSE RELATIONSHIPS; ETCHING; MATERIALS

1751 (INIS-mf–13731, pp. 299) **Measurement of 14 MeV neutron fluences using SSNTDs.** Cheng Yulin (Shanghai Inst. of Nuclear Research, Academia Sinica, Shanghai (China)); Lin Junying; Zhang Bufa; Lu Rong; Zheng Liping. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/neutron fluence; EFFICIENCY; MEV RANGE 10-100; POLYCARBONATES; RESINS

1752 (INIS-mf–13731, pp. 300) **Measurement of energy spectrum parameter in irradiation tube of prototype miniature neutron source reactor (MNSR) with SSNTD.** Chen Shaoneng (China Inst. of Atomic Energy, Beijing (China)); Li Dejiang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MNS REACTOR/neutron spectra; NEUTRON SPECTRA/dielectric track detectors; COMPARATIVE EVALUATIONS; ERRORS

1753 (INIS-mf–13731, pp. 317) **Autoradiographic investigation of low energy activity using SSNTD.** Eissa, H.M.; Sharaf, M.A.; Hassan, G.M.; El Fiki, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/dielectric track detectors; ACETATES; ACTIVITY LEVELS; AUTORADIOGRAPHY; KIDNEYS; LIVER; RATS

1754 (INIS-mf–13731, pp. 321) **An investigation on in-air distribution of metal dust during machining, using solid state nuclear track detectors.** Majeed, A. (Inst. of Industrial Automation, Islamabad (Pakistan)); Hussain, Z.; Humanyun, F.; Ahmed, S.M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AIR/dusts; AIR/pollution; DIELECTRIC TRACK DETECTORS/dusts; AIR; DUSTS; POLLUTION; MACHINING; METALS; SPATIAL DISTRIBUTION; WORKING CONDITIONS

1755 (INIS-mf–13731, pp. 340) **CR-39 and LR-115 as a secondary standard dosimeter for radon measurements.** Eissa, H.M. (National Inst. for Standards, Cairo (Egypt)); Sharaf, M.A.; Lotfy, M.; El Fiki, M.A.; Kenawy, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/dosemeters; DIELECTRIC TRACK DETECTORS/radon; ALPHA PARTICLES; DOSEMETERS; RADON; RADIATION DETECTION; RESPONSE FUNCTIONS; SECONDARY EMISSION DETECTORS

1756 (INIS-mf–13731, pp. 342) **Radon measurements with LR115 and CR-39.** Adriamanantena, R. (Inst. fuer Reine und Angewandte Kernphysik, Christian Albrechts Univ., Kiel (Germany)); Kleis, T.; Ghose, R.; Enge, W. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radon; DIELECTRIC TRACK DETECTORS/sensitivity; CONTAINERS; RADON; SENSITIVITY; MATHEMATICAL MODELS; RADIATION DETECTION

1757 (INIS-mf–13731, pp. 347) **Performance of the alpha-spectrometer CR-39 versus etching time and its possible application in radon/thoron discrimination.** Hadler N, J.C. (Dept. de Raios Cosmicos e Cronologia, Univ. Estadual de Campinas (Brazil)); Iunes, P.J.; Policastro, A.P.; Paulo, S.R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA SPECTROMETERS/dielectric track detectors; ALPHA SPECTROMETERS/performance; DIELECTRIC TRACK DETECTORS/alpha spectrometers; DIELECTRIC TRACK DETECTORS/particle discrimination; PERFORMANCE; ETCHING; RADIATION MONITORING; RADON 220; RADON 222

1758 (INIS-mf–13731, pp. 348) **Comparison of effectiveness of 3 radon detectors (LR 115, CR 39 and Silicon Diode Pin) placed in a cylindrical device: theory and experimental techniques.** Barillon, R. (Lab. de Microanalyses Nucleaires, UFR de Sciences et Techniques, La Bouloie, Univ. de Franche Comte, Besancon (France)); Chambaudet, A.; Devillard, C.; Klein, D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/comparative evaluations; DIELECTRIC TRACK DETECTORS/radon; RADON; EFFICIENCY; EMANATION METHOD; MATHEMATICAL MODELS; SILICON DIODES

1759 (INIS-mf–13731, pp. 349) **Features of a new Russian track detector for radon measurement.** Chambaudet, A. (Lab. de Microanalyses Nucleaires, UFR des Sciences et Techniques, La Bouloie, Univ. de Franche Comte, Besancon (France)); Pautov, V.; Klein, D.; Barenboim, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/performance; DIELECTRIC TRACK DETECTORS/radon; PERFORMANCE; RADON; ETCHING; GEOMETRY; POLYMERS; SENSITIVITY

1760 (INIS-mf–13731, pp. 352) **An automatic electronic counter for short term radon measurements in soil and/or water.** Morin, J.P. (Lab. d'Hydrogeologie, Centre National de la Recherche Scientifique Univ. Montpellier II, Montpellier (France)); Seidel, J-L.; Monnin, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIATION DETECTORS/radon; RADON/soils; RADON/water; AUTOMATION; COUNTING CIRCUITS; GEOLOGY; RADON; SOILS; WATER; SILICON DIODES

1761 (INIS-mf–13731, pp. 355) **Response of different passive detectors in a radon chamber.** Azimi-Garakani, D. (Radiation Hygiene Division, Paul Scherrer Inst., Villiggen PSI (Switzerland)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIATION MONITORS/response functions; RADON/radiation monitors; CALIBRATION; COMPARATIVE EVALUATIONS; HUMIDITY; IRRADIATION; RADON

1762 (INIS-mf–13731, pp. 357) **Soil radon dosimeter for hot humid tropical region.** Mahat, R.H. (Physics Dept., Univ. of Malaya, Kuala Lumpur (Malaysia)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/radon; RADON/soils; RADON/tropical regions; DIELECTRIC TRACK DETECTORS; DIFFUSION CHAMBERS; DOSEMETERS; RADON; SOILS

1763 (INIS-mf–13731, pp. 358) **Radon dosimeter: optimization of geometrical parameters for underground measurements.** Tufail, M. (Centre for Nuclear Studies, Islamabad (Pakistan)); Mirza, S.M.; Qureshi, I.E.; Khan, H.A.; Qureshi, A.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSEMETERS/geometry; DOSEMETERS/radon; DIELECTRIC TRACK DETECTORS; DOSEMETERS; GEOMETRY; RADON; MONTE CARLO METHOD; OPTIMIZATION; SENSITIVITY; UNDERGROUND

1764 (INIS-mf–13731, pp. 359) **Study of the two-step electrochemical etching conditions applied to polycarbonate detectors used in radon diffusion chambers.** Baixeras, C. (Fisica de les Radiacions, Dept. de Fisica, Univ. Autonoma de Barcelona (Spain)); Font, Ll.; Fernandez, F.; Domingo, C.; Piesch, E.; Burgkhardt, B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/etching; DIELECTRIC TRACK DETECTORS/polycarbonates; ETCHING; POLYCARBONATES; DIFFUSION CHAMBERS; ELECTROCHEMISTRY; RADON

1765 (INIS-mf–13731, pp. 366) **A small passive monitor for radon with CR-39 (DAP).** Pang Deling (Inst. of Radiation Medicine, Shanghai Medical Univ., Shanghai (China)); Li Landi; Zhu Bing. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/dielectric track detectors; RADON/radiation monitors; DESIGN; DIFFUSION CHAMBERS; HUMIDITY; RADON; SENSITIVITY

1766 (INIS-mf–13731, pp. 367) **A non-constant concentration radon calibration chamber.** Pang Deling (Inst. of Radiation Medicine, Shanghai Medical Univ., Shanghai (China)); Li Landi; Zhu Bing. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/calibration; RADON/diffusion chambers; CONCENTRATION RATIO; DESIGN; RADON; CALIBRATION; RESPONSE FUNCTIONS

1767 (INIS-mf–13731, pp. 380) **Preparation and characteristics of $CaSO_4$: Dy thermoluminescent dosemeter.** Fernandez, F. (Fisica de les Radiacions, Dept. de Fisica, Univ. Autonoma de Barcelona (Spain)); Luguera, E.; Baixeras, C.; Domingo, C.; Prevost, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMOLUMINESCENT DOSEMETERS/chemical preparation; THERMOLUMINESCENT DOSEMETERS/

performance; CALCIUM SULFATES; DOPED MATERIALS; DYSPROSIUM; HEAT TREATMENTS; SENSITIVITY; PERFORMANCE

1768 (INIS-mf–13731, pp. 382) **Theoretical calculations and Monte Carlo simulations of multiple hole probabilities for etched nuclear tracks.** Wang Yulan (Inst. of Atomic Energy, Beijing (China)); Zhu Tiancheng. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ETCHING/computerized simulation; ETCHING/openings; PARTICLE TRACKS/etching; ETCHING; OPENINGS; MONTE CARLO METHOD; MULTIPLICITY; POROSITY; PROBABILITY

1769 (JAERI-M–93-115) **Wall effect correction for a small cylindrical proportional counters.** Pulpan, J. (Ceskoslovenska Akademie Ved, Prague (Czechoslovakia). Ustav Radiologicke Dozimetrie). Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 20p. Order Number DE94718745. Source: OSTI; NTIS; INIS.

The wall effect correction has been investigated for a small cylindrical proton recoil proportional counter used as a detector for neutron spectroscopy in the energy range of 0.01-1 MeV. The probability that a proton escapes to wall is calculated by the method based on a path length probability function. The probability is applied to calculation of the counter response for the isotropic neutron field. This method is also applied directly to correction for the deposited energy distribution of recoiled protons measured by a hydrogen-argon filled proportional counter. The effect of the correction on the unfolded neutron spectrum is examined. (author).

1770 (JINR–13-92-121) **Digital filtration of information for the many-dimensional spectrometer UKOR.** Bogdzel', A.A.; Vagov, V.A.; Lyapin, D.I.; Salamatin, I.M.; Sirotin, A.P.; Tishin, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 6p. (In Russian). Order Number DE94606021. Source: OSTI; NTIS (US Sales Only); INIS.

The system based on the microcomputer SM1300 and CAMAC equipment for multiparameter measuremenets on spectrometric multidetector set-up UKOR is described. The system allows to perform the multidimensional analysis with registration of the amplitude, time and number of the amplitude detector. The unit of digital windows is used for the preliminary selection of spectrometric information with the program parameters. The system provides control for the physics unit UKOR, the control for system parameters and the graphic representation of spectra. 6 refs.; 4 figs.

1771 (JINR–18-92-180) **Two-dimensional multiwire detector of high resolution for x-ray diffractometer.** Zanevskij, Yu.V. (and others); Donets, D.E.; Ivanov, A.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy; AN SSSR, Moscow (Russian Federation). Inst. Kristallografii. 1992. 14p. (In Russian). Order Number DE94606117. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Kristallografiya.

The construction and the mean features of the advanced ARD-1M detector based on a flat MWPC with delay lines read out are described. Major differences of this detector to the earlier used one (ARD-1) are the following: the thickness of a conversion gap is 20% reduced (i.e. up to 8 mm) for the parallax attenuation; the anode wires step is matched with a TDC discrete; the fast TDCs have differential nonlinearity <0.5% and dead time approximately 50 ns; personal computer IBM PC/AT-386 is used for data acquisition; programm correction is inserted. As a result the following main parameters have been achieved: number of diffraction pattern pixels - 250x250 (1.3 mm x 1.3 mm); quantum efficiency uniformity - 0.6%; pixel size uniformity - up to 0.5-1%; geometrical nonlinearity - 0.25-0.4 mm; maximum count rate approximately 330 kHz (event loss ≤30%) (at doubled set of the TDCs). 15 refs.; 5 figs.; 1 tab.

1772 (JINR-E–1-92-333) **Integral analysis of tracks data in solenoid.** Yatsunenko, Yu.A.; Selunin, S.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 15p. Order Number DE94606063. Source: OSTI; NTIS (US Sales Only); INIS.

The typical number of operations is proportional to M^2 M is the multiplicity or the tracks number. This idea is based on the integral mathematical model of the track pattern and does not contain a procedure of the trajectories reconstruction. 6 refs.; 7 figs.

1773 (JINR-E–1-92-414) **Trigger for decays of B-mesons produced at 20 TeV.** Bojko, I.R. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Takhtamyshev, G.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 7p. Order Number DE94606064. Source: OSTI; NTIS (US Sales Only); INIS.

A configuration for heavy particles decays selection in extracted beams experiments at energies 70 GeV and 3 TeV has been suggested earlier. In this paper the possibility of using this type of trigger for a selection of B-meson decay events at 20 TeV is tested. It is shown that the trigger provides the means for increasing the ratio of useful events to background by factor of ten or near that. 5 refs.; 5 figs.

1774 (JINR-E–1-93-115) **Energy losses of fast charged particles in thin silicon detectors.** Akimov, K.Yu. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Ivanov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 6p. Order Number DE94606065. Source: OSTI; NTIS (US Sales Only); INIS.

The Monte Carlo method for the calculation of fast charged particle ionization losses in thin silicon layers for the range of thicknesses from 1 to 100 μm, is developed. The dependence of the energy-loss distribution on the thickness of a layer is investigated and the calculation results are compared with the existing experimental data and analytical results. 8 refs.; 6 figs.; 1 tab.

1775 (JINR-E–10-92-352) **Track reconstraction in discrete detectors by neutral networks.** Glazov, A.A.; Kisel', I.V.; Konotopskaya, E.V.; Neskoromnyj, V.N.; Ososkov, G.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 12p. Order Number DE94606066. Source: OSTI; NTIS (US Sales Only); INIS.

On the basis of applying neutral networks to the track recognition problem the investigations are made according to the specific properties of such discrete detectors as multiwire proportional chambers. These investigations result in the modification of the so-called rotor model in a neutral neural network. The energy function of a network in this modification contains only one cost term. This speeds up calculations considerably. The reduction of the energy function is done by the neuron selection with the help of simplegeometrical and energetical criteria. Besides, the cellular automata were applied to preliminary selection of data that made it possible to create an initial network configuration with the energy closer to its global minimum. The algorithm was tested on 10^4 real three-prong events obtained from the ARES-spectrometer. The results are satisfactory including the noise robustness and good resolution of nearby going tracks. 12 refs.; 10 figs.

1776 (JINR-E–10-93-86) **Track filtering by robust neural network.** Baginyan, S.A.; Kisel', I.V.; Konotopskaya, E.V.; Ososkov, G.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 11p. Order Number DE94606067. Source: OSTI; NTIS (US Sales Only); INIS.

In the present paper we study the following problems of track information extraction by the artificial neural network (ANN) rotor model: providing initial ANN configuration by an algorithm general enough to be applicable for any discrete detector in- or out of a magnetic field; robustness to heavy contaminated raw data (up to 100% signal-tc-noise ratio); stability to the growing event multiplicity. These problems were carried out by corresponding innovations of our model, namely: by a special one-dimensional histogramming, by multiplying weights by a specially designed robust multiplier, and by replacing the simulated annealing schedule by ANN dynamics with an optimally fixed temperature. Our approach is valid for both circular and straight (non-magnetic) tracks and tested on 2D

simulated data contaminated by 100% noise points distributed uniformly. To be closer to some reality in our simulation, we keep parameters of the cylindrical spectrometer ARES. 12 refs.; 9 figs.

1777 (JINR-E–13-92-52) **A two-dimensional detector with delay line readout for slow neutron fields measurements.** Cheremukhina, G.A. (and others); Chernenko, S.P.; Ivanov, A.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 26p. Order Number DE94606069. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Instrum. Methods.

This article presents the description of a two-dimensional detector of slow neutrons together with its readout and data acquisition electronics based on a PC/AT> The detector with a sensitive area of 260x140 mm^2 is based on a high pressure multiwire proportional chamber with delay line readout and gas filling of 3.0 atm. ^3He + propane. 25 refs.; 10 figs.; 2 tabs.

1778 (JINR-E–13-92-219) **Study of a 260-channel lead glass calorimeter.** Budagov, Yu.A. (and others); Chlachidze, G.A.; Liba, I.P.; Malyukov, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 14p. Order Number DE94606068. Source: OSTI; NTIS (US Sales Only); INIS.

The characteristics of a 260-channel Cherenkov hodoscope calorimeter made of lead glass blocks have been studied in a 3-8 GeV positron beam. 19 refs.; 16 figs.

1779 (JINR-E–13-92-545) **FASA - A 4π detector setup for the investigation of target multifragmentation in nucleus-nucleus collisions.** Avdeev, S.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Karnaukhov, V.A.; Kuznetsov, V.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 15p. Order Number DE94606070. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Instrum. Methods.

The FASA setup, installed at the JINR synchrophasotron providing light ion beams with energies up to 3.65 GeV/nucleon, is a fragment multiplicity detector, consisting of 55 scintillation counters made of thin CsI(Tl) films, five time-of-flight telescopes and a large area position-sensitive parallel-plate avalanche chamber. The basic aim of the device is to determine with high precision the energy, mass and velocity of the fragmentas detected in the time-of-flight telescopes (TOF) while for the other fragmenta global multiplicity information is obtained. Therefore, the TOF telescopes serve as a trigger. In addition, angular correlations and distribution and relative velocity correlations for coincident fragmentas can be measured with the FASA setup. 11 refs.; 13 figs.

1780 (JINR-R–1-92-376) **Analysis of data in experimental investigation of the decay $K^+ \to \pi^0 e^+ \nu$ on the Hyperon facility.** Velev, G.V. (Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika); Rusakovich, N.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 22p. (In Russian). Order Number DE94606071. Source: OSTI; NTIS (US Sales Only); INIS.

A procedure of the analysis of the information obtained in an experimental investigation of the leptonic decay on the hyperon facility is described. The procedure includes programs of geometrical and kinematical events reconstructions, registration efficiency calculation and statistical analysis. The obtained accuracy of the physical values is given. An independent approximation of the experimental data with a polar form factor as suggested by the K^* dominance model is realized. The full computer software presented here could be used in data treatment obtained in the other K^+-decay mode on the Hyperon facility. 30 refs.; 17 figs.; 2 tabs.

1781 (JINR-R–1-92-525) **Cherenkov radiation of charged particles beam in thick radiator.** Kuz'min, E.S.; Tarasov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 11p. (In Russian). Order Number DE94606072. Source: OSTI; NTIS (US Sales Only); INIS.

The formulae for calculation of Cherenkov radiation angular dnsity in consideration with multiple scattering and particles energy losses in radiator are obtained. The contribution of energy and angular distribution to the radiation angular width is considered. The method of particles energy dispersion measurements is proposed. 8 refs.; 4 figs.

1782 (JINR-R–3-92-325) **Calculation of the response function of the neutron detector based on liquid organic scintillator.** Daniehl', A.V. (Radievyj Inst., Leningrad (Russian Federation)); Kozulin, Eh.M.; Kuznetsov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1992. 10p. (In Russian). Order Number DE94606018. Source: OSTI; NTIS (US Sales Only); INIS.

Calculation methods of the response function of the neutron detector based on a liquid organic scintillator are discussed. 11 refs.; 4 figs.

1783 (JINR-R–3-92-346) **Determination of neutron resonance parameters in ^{149}Sm by the γ-multiplicity spectrometry method.** Georgiev, G.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Zamyatnin, Yu.S.; Pikel'ner, L.B.; Fajkov-Stanchik, Kh.; Grigor'ev, Yu.V.; Muradyan, G.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 8p. (In Russian). Order Number DE94606019. Source: OSTI; NTIS (US Sales Only); INIS.

The neutron radiative capture and scattering measurements for enriched isotope ^{149}Sm are performed on neutron spectrometer LNPh JINR by a γ-rays multiplicity method using the multisectional 4π-detector 'Romanshka'. Spins and radiative widths of neutron resonances are obtained up to 300 eV. 40 new radiative widths are determined. 7 refs.; 2 figs.; 1 tab.

1784 (JINR-R–6-92-148) **The new method of the Compton background substraction in the analysis of $\gamma\gamma$-coincidences measured by the method of sum amplitudes of coinciding pulses (SACP).** Vasil'ev, Eh.V.; Voinov, A.V.; Kulik, V.D.; Popov, Yu.P.; Sukhovoj, A.M.; Khitrov, V.A.; Khol'nov, Yu.V.; Shilin, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 10p. (In Russian). Order Number DE94606020. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Organizing Committee of the 42-nd International Conference of Nuclear Spectroscopy and Atomic Nucleus Structure, Alma-Ata, April 1992.

The background structures remained in the differential spectra of two-quantum cascades after background subtraction by the method described in the preprint of the JINR P6-87-98 make difficult these spectra interpretation and reduce the SACP measurements energy interval. The idea of a two-step background subtraction is discussed. On the example of ^{170}Lu decay it was demonstrated that this new method of Compton background subtration results in full disappearance of these unwanted bachground structures. 3 refs.; 6 figs.

1785 (JINR-R–10-92-156) **Possibility of neutral network usage for B-meson events selection in calorimetric trigger.** Ivanov, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Sever'yanov, V.M.; Poroshin, N.O. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 12p. (In Russian). Order Number DE94606073. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Matematicheskoe Modelirovanie.

A possibility of feed-forward neutral usage for B-meson events selection in calorimetric trigger of multiparticle spectrometer MPS was investigated with the help of Monte-Carlo generated model data. A comparison of indicated events selection with the help of neutral network and traditional method based on distinctions in distributions of transfer energy has shown an advantage and perspectivity of a new approach. 18 refs.; 6 figs.

1786 (JINR-R–13-92-200) **Drift chambers on the basis of mylar tubing blocks.** Budagov, Yu.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Golovanov, L.B.; Kuritsin, A.A.; Pukhov, O.E.; Khazins, D.M.; Chirikov-Zorin, I.E.; Zhukov, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 7p. (In Russian). Order Number DE94606074. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Instrum. Methods.

We tested the models of the drift chambers, which are constructed of mylar tubing blocks. The purpose of the tubing block forming technology is to create long chambers (up to 3-4 meters). There are count and drift characteristics of the chambers for different gas pressures and different diameters of sense wires. The service time of the chambers is defined. We registered a photoeffect in the visible spectrum area, which is displayed on the surface of the mylar film cathode, covered by aluminium. 8 refs.; 5 figs.

1787 (JINR-R–13-92-215) **Circular small-size beam chamber.** Kravchuk, N.P.; Filippov, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 4p. (In Russian). Order Number DE94606075. Source: OSTI; NTIS (US Sales Only); INIS.

Construction and results of testing circular multiwire proportional chamber are described. The chamber may be accomodated in beam collimator diameter 160 mm. 5 refs.; 3 figs.

1788 (JINR-R–13-92-216) **Gas target with thin wall.** Korenchenko, A.S.; Korenchenko, S.M.; Kravchuk, N.P.; Filippov, A.I.; Fursov, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 6p. (In Russian). Order Number DE94606076. Source: OSTI; NTIS (US Sales Only); INIS.

The technology of targets manufacture with thin wall diameter 100 mm and lengthwise 700 mm from composition kevlar + epoxy resin is described. The test's results on pressure and vacuum are reported. The created targets are supposed to be used on the installation ARES for an investigation of muons and pions interactions with light nuclei and rare pions decay 'on flying'. 5 refs.; 2 figs.; 2 tabs.

1789 (JINR-R–13-92-331) **Multi-module scintillation CsI(Tl) spectrometer for gamma-quanta detection in energy range (1-100 MeV).** Sobolev, Yu.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Ivanov, M.P.; Kuznetsov, I.V.; Daniehl', A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1992. 16p. (In Russian). Order Number DE94606017. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Prib. Tekh. Ehksp.

The spectrometer, built up of 7 CsJ(Tl)-scintillation crystals of hexagonal shape (the diameter of the circumscribed circle being 100 mm) 150 mm long and a photomultiplier FEU-110, is described. The results of the energy calibration in the region 100 keV-2 100 MeV and the modelling of the response functions of the spectrometer to monoenergy gamma-radiation by the Monte-Carlo method using computer code GEANT-3 are presented. The preliminary results of the measuring of the gamma-spectra in the spontaneous fission of ^{248}Cm are presented. 24 refs.; 12 figs.

1790 (JINR-R–13-92-347) **Diagnostics of a streamer chamber gas filling of the GIBS spectrometer.** Aksinenko, V.D.; Glagoleva, N.S.; Mandrik, O.Yu.; Matyushin, A.T.; Matyushin, V.T.; Mirkowski, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 7p. (In Russian). Order Number DE94606077. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Prib. Tech. Ehksp.

The analysis of the diagnostics data of a streamer chamber gas filling, with a volume about 1 m^3, has been provided under its working conditions at the JINR synchrophasotron. An optimization methods (of time and expenditure) of a process of putting the chamber to a working regime and carrying out this regime using a computer and multicontour electric schemes with RC-chains are suggested in the investigation as well. 4 refs.; 4 figs.; 1 tab.

1791 (JINR-R–13-92-513) **Two-coordinate multiwire proportional chamber for SINDRUM spectrometer.** Nekrasov, K.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 8p. (In Russian). Order Number DE94606078. Source: OSTI; NTIS (US Sales Only); INIS.

Two-coordinate multiwire proportional chamber has been constructed at the JINR Laboratory of Nuclear Problems. 3 refs.; 7 figs.; 1 tab.

1792 (JINR-R–13-92-524) **Multirange time-to-digital converter.** Zinov, V.G.; Mar'in, N.A.; Selikov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 4p. (In Russian). Order Number DE94606116. Source: OSTI; NTIS (US Sales Only); INIS.

A time-to-digital converter of type T-A-T is described. Changing of the convertion range is accomplished by means of the current Digital-to Analog Converter. 4 figs.

1793 (JINR-R–13-92-526) **The spectrometric complex HYPERON for investigation of rare K-meson decays.** Asmolov, A.G. (and others); Bitsadze, G.S.; Blik, A.M. Collaboration IFVE-OIYal. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 17p. (In Russian). Order Number DE94606079. Source: OSTI; NTIS (US Sales Only); INIS.

The spectrometric complex for investigation of K-meson decays based on the HYPERON setup is described. 36 refs.; 12 figs.

1794 (KCP–613-5153) **Enhanced software for the GT1022 automated gaging system: Final report.** Hines, R.E. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001374. Source: OSTI; NTIS; GPO Dep.

Several enhancements have been added to the gaging software of a microcomputer-controlled gaging system (GT1022) that is used to acquire and process dimensional product data from multiprobe rotary gages. Processing routines have been developed to inspect five additional feature types: dimension, least squares center, MMC position with datum diameter bonus, total indicator reading, and two-sided wall thickness. Mathematical alignment routines have been added that permit parts to be gaged in a misaligned condition and then have the measurements corrected relative to the part's datum axes.

1795 (LA-UR–93-3021) **The front-end electronics for the L3 Silicon Microvertex Detector.** Mills, G.B. Los Alamos National Lab., NM (United States). 12 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9305276–1: Electronics for future colliders, Chestnut Ridge, NY (United States), 4-5 May 1993). Order Number DE93040132. Source: OSTI; NTIS; INIS; GPO Dep.

The L3 detector, located at the LEP storage ring at CERN (European Center for Nuclear Research), has recently installed a silicon microvertex detector (SMD). The purpose of the SMD is to enhance the tracking capabilities of L3 and to provide increased vertex measurement precision for tagging b-jets in the search for the Higgs boson, when LEP doubles its center of mass energy for the LEP 200 running. The subject of this article is the fabrication and testing of the front-end electronics for the SMD. The article is organized into several sections. The first section describes the SMD, the second section discusses the front-end electronics, the third section presents the testing procedures and the results of the tests.

1796 (LBL–34541) **Soft x-ray interferometry.** Lawrence Berkeley Lab., CA (United States). Sep 1993. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9306201–: Advance light source workshop on soft x-ray interferometry, Berkeley, CA (United States), 25 Jun 1993). Order Number DE94002308. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the soft x-ray interferometry workshop held at Lawrence Berkeley Laboratory was to discuss with the scientific community the proposed technical design of the soft x-ray Fourier-transform spectrometer being developed at the ALS. Different design strategies for the instrument's components were discussed, as well as detection methods, signal processing issues, and how to meet the manufacturing tolerances that are necessary for the instrument to achieve the desired levels of performance. Workshop participants were encouraged to report on their experiences in the field of Fourier transform spectroscopy. The ALS is developing a Fourier transform spectrometer that is intended to operate up to 100 eV. The motivation is solely improved resolution and not the throughput (Jaquinot) or multiplex (Fellgett) advantage, neither of which apply for the sources and detectors used in this spectral range. The proposed implementation of this is via a Mach-Zehnder geometry that has been (1) distorted from a square to a rhombus

to get grazing incidence of a suitable angle for 100 eV and (2) provided with a mirror-motion system to make the path difference between the interfering beams tunable. The experiment consists of measuring the emergent light intensity (I(x)) as a function of the path difference (x). The resolving power of the system is limited by the amount of path difference obtainable that is 1 cm (one million half-waves at 200Å wavelength) in the design thus allowing a resolving power of one million. The free spectral range of the system is limited by the closeness with which the function I(x) is sampled. It is proposed to illuminate a helium absorption cell with roughly 1%-band-width light from a monochromator thus allowing one hundred aliases without spectral overlap even for sampling of I(x) at one hundredth of the Nyquist frequency.

1797 (OUP–93-15) **Light output and energy resolution of BGO and GSO scintillators for light ions.** Avdeichikov, V.V. (Khlopin Radium Inst., St. Petersburg (Russian Federation)); Bergholt, L.; Guttormsen, M.; Taylor, J.E. Oslo Univ. (Norway). Fysisk Inst. Jul 1993. 10p. Order Number DE94606022. Source: OSTI; NTIS; INIS.

Light output and energy resolution of BGO and GSO crystals with photodiode readout have been measured for ^{1}H, ^{2}H and ^{3}H ions in the energy range of 3 to 15 MeV/nucleon. 8 refs., 2 figs., 1 tab.

1798 (SAND–92-2532C) **Development of an alanine dosimeter for gamma dosimetry in mixed environments.** Vehar, D.W.; Griffin, P.J. Sandia National Labs., Albuquerque, NM (United States). [1992]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930809–3: 8. ASTM-EURATOM symposium on reactor dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE93040051. Source: OSTI; NTIS; INIS; GPO Dep.

L-αa-Alanine, a nontoxic polycrystalline amino acid, has been investigated for use in high-precision, high-level absorbed-dose measurements in mixed neutron/photon environments such as research and test reactors. The technique is based on the use of electron paramagnetic resonance (EPR) spectroscopy to determine the extent of free radical production in a sample exposed to ionizing radiation, and has been successfully used for photon absorbed-dose measurements at levels exceeding 10^5 Gy with high measurement precision. Application of the technique to mixed environments requires knowledge of the energy-dependent response of the dosimeter for both photons and neutrons. Determination of the dosimeter response to photons is accomplished by irradiations in ^{60}Co and bremsstrahlung sources and by calculations of energy-dependent photon kerma. Neutron response is determined by calculations in conjunction with CaF_2:Mn thermoluminescence dosimeters and by calculations of energy-dependent neutron kerma. Several neutron environments are used, including the ACRR and SPR-III reactors.

1799 (SLAC-PUB–6276) **Performance of the CRID at SLD.** Abe, K. (Tohoku Univ., Sendai (Japan). Dept. of Physics); Antilogus, P.; Aston, D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9306188–3: 1. workshop on RICH detectors, Bari (Italy), 1-5 Jun 1993). Order Number DE93041018. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the performance of a large 4π Cherenkov Ring Imaging Detector (CRID) in the SLD experiment at the SLC at SLAC. We compare the most recent SLD results with those obtained during the R&D period, discuss various design features, and highlight some specific lessons derived from three years of operation.

1800 (UCRL-ID–113833) **Resistive Plate Chamber technology review.** Widgoff, M. (Brown Univ., Providence, RI (United States)); Alyea, E.D.; Ables, E. Lawrence Livermore National Lab., CA (United States). 6 Oct 1992. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000952. Source: OSTI; NTIS; GPO Dep.

A review of the resistive plate chamber technology option for the GEM muon system.

1801 (UCRL-ID–114672) **Safety analysis of the GEM Detector Magnet conductor.** Ferri, M.A.; Hassenzahl, W.V. Lawrence Livermore National Lab., CA (United States). 27 Aug 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000955. Source: OSTI; NTIS; INIS; GPO Dep.

The safety of the GEM Detector Magnet is analyzed using a computational model to determine current sharing between the cabled conductor and the external aluminum stabilizer. The model includes inductive and transverse conductive effects due to the geometries of the coil and the conductor. A conservative analysis indicates a peak conductor hotspot temperature of $\sim$ 50 K at two seconds after the initiation of quench. After this time, additional heating is limited because most of the current in the normal zone region is carried by the aluminum stabilizer and an external protection circuit should have begun to diminish the total current. The analysis shows that conductor safety requires adequate transverse conductivity between the cable and the aluminum stabilizer. The calculated transverse conductance of the GEM conductor, 1×10^7 mho/m, is at least 100 times greater than the minimum value necessary to limit the hotspot temperature to $\sim$ 50 K after two seconds. This report describes the results of calculations based on a realistic assumption of GEM conductor performance during a quench.

1802 (UCRL-ID–115112) **Radiation environment and shielding for the GEM experiment at the SSC.** Diwan, M. (and others); Fisyak, Y.; Mokhov, N. Lawrence Livermore National Lab., CA (United States). 16 Aug 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001853. Source: OSTI; NTIS; GPO Dep.

We have performed a comprehensive study of the radiation environment for the proposed GEM detector at the SSC. As a result of this study, we have developed a shielding scenario that will ensure that the detector will operate with its design performance for at least 10 years at the luminosity of 10^{33} cm $^{-2}s^{-1}$.

1803 (UCRL-JC–108983) **Novel, moveable, multi-anode x-ray source for imaging detector calibrations.** Tirsell, K.G.; Bowers, M.W.; Elsholz, A.J.; Randolph, J.E. Lawrence Livermore National Lab., CA (United States). Jul 1992. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920792–66: 37. annual Society of Photo-Optical Instrumentation Engineers (SPIE) international symposium on optical and optoelectronic applied science and engineering, San Diego, CA (United States), 19-24 Jul 1992). Order Number DE93040541. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a moveable, multi-anode, electron-induced x-ray source for calibrating x-ray imaging detector systems. The source features four water-cooled, copper-based anodes that are easily replaced and interchangeable under vacuum. A spherically-symmetric filament and anode configuration yields very symmetrical source spot sizes variable from 1 to 5-mm diam. The source is coupled to vacuum by means of a triple-axis translator with x and z motions computer controlled to better than $\pm$ 13-μm step accuracy. Absolute source flux is continuously monitored with a proportional counter. We characterize the source spot in detail by aiming the anode towards a pin-hole imaging x-ray detector system. To date we have used Co, Fe, Mg, and Ge vapor-deposited on copper anodes. When filtered with Ni or Mg foils, these emitting materials provide sets of four moderately pure x-ray lines below 1.5 keV. High deposition purity as well as 1E-7 torr source chamber pressures help reduce source degradation. Source translation and data acquisition are computer controlled using a Macintosh/LabVIEW software system. We discuss the application of our source configuration to spatial calibrations of extended pinhole and slit imaging detector systems. In addition, our multi-anode capability is useful for calibrating x-ray spectrograph response versus wavelength.

1804 (UCRL-JC–113475) **Potential of Computed Tomography for inspection of aircraft components.** Azevedo, S.G.; Martz, H.E.; Schneberk, D.J. Lawrence Livermore National Lab., CA (United States). Aug 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–23: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States),

11-16 Jul 1993). Order Number DE93019377. Source: OSTI; NTIS; GPO Dep.

Computed Tomography (CT) using penetrating radiation (x- or gamma-rays) can be used in a number of aircraft applications. This technique results in 3D volumetric attenuation data that is related to density and effective atomic number. CT is a transmission scanning method that must allow complete access to both sides of the object under inspection; the radiation source and detection systems must surround the object. This normally precludes the inspection of some large or planar (large aspect ratio) parts of the aircraft. However, we are pursuing recent limited-data techniques using object model information to obtain useful data from the partial information acquired. As illustrative examples, we describe how CT was instrumental in the analysis of particular aircraft components. These include fuselage panels, single crystal turbine blades, and aluminumlithium composites. These tests were performed by the members of the Nondestructive Evaluation Section at the Lawrence Livermore National Laboratory (LLNL) where we have been actively working in CT research and development. The aerospace applications can represent various phases of the design, manufacture, assembly, test, and retirement of various components and assemblies.

1805 (UCRL-JC–113741) **X- and Γ-ray computed tomography applications at LLNL.** Roberson, G.P.; Martz, H.E.; Schneberk, D.J.; Azevedo, S.G. Lawrence Livermore National Lab., CA (United States). Apr 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9304189–2: 1993 joint Army, Navy, NASA, Air Force (JANNAF) nondestructive evaluation subcommittee meeting, Livermore, CA (United States), 26-28 Apr 1993). Order Number DE93018645. Source: OSTI; NTIS; GPO Dep.

Members of the Nondestructive Evaluation (NDE) Section at the Lawrence Livermore National Laboratory (LLNL) have implemented the advanced three-dimensional imaging technique of x and γ-ray computed tomography (CAT or CT) for industrial and scientific nondestructive evaluation. This technique provides internal and external views of materials, components, and assemblies nonintrusively. Our research and development includes building CT scanners as well as data preprocessing, image reconstruction, display and analysis algorithms. These capabilities have been applied for a variety of industrial and scientific NDE applications where objects can range in size from 1 mm^3 to 1 m^3. Here we discuss the usefulness of Cr to evaluate: Ballistic target materials, high-explosives shape charges, missile nosetips, and reactor-fuel tubes.

1806 (UCRL-JC–114445) **The GEM Detector projective alignment simulation system.** Wuest, C.R. (Lawrence Livermore National Lab., CA (United States)); Belser, F.C.; Holdener, F.R.; Roeben, M.D.; Paradiso, J.A.; Mitselmakher, G.; Ostapchuk, A.; Pier-Amory, J. Lawrence Livermore National Lab., CA (United States). 9 Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309204–1: 3. international workshop on accelerator alignments, Annecy (France), 28 Sep - 1 oct 1993). Order Number DE93018653. Source: OSTI; NTIS; INIS; GPO Dep.

Precision position knowledge (< 25 microns RMS) of the GEM Detector muon system at the Superconducting Super Collider Laboratory (SSCL) is an important physics requirement necessary to minimize sagitta error in detecting and tracking high energy muons that are deflected by the magnetic field within the GEM Detector. To validate the concept of the sagitta correction function determined by projective alignment of the muon detectors (Cathode Strip Chambers or CSCs), the basis of the proposed GEM alignment scheme, a facility, called the "Alignment Test Stand" (ATS), is being constructed. This system simulates the environment that the CSCs and chamber alignment systems are expected to experience in the GEM Detector, albeit without the 0.8 T magnetic field and radiation environment. The ATS experimental program will allow systematic study and characterization of the projective alignment approach, as well as general mechanical engineering of muon chamber mounting concepts, positioning systems and study of the mechanical behavior of the proposed 6 layer CSCs. The ATS will consist of a stable local coordinate system in which mock-ups of muon chambers (i.e., non-working mechanical analogs, representing the three superlayers of a selected barrel and endcap alignment tower) are implemented, together with a sufficient number of alignment monitors to overdetermine the sagitta correction function, providing a self-consistency check. This paper describes the approach to be used for the alignment of the GEM muon system, the design of the ATS, and the experiments to be conducted using the ATS.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

Refer also to citation(s) 1119, 1279, 2569

1807 (INIS-mf–13731, pp. 115) **The effect of X-ray irradiation on track formation in LR-115 type II track detector.** Chong, C.S. (School of Physics, Univ. Sains Malaysia, Penang (Malaysia)); Chan, Marina A.C.; Tan, L.F. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/ radiation effects; DIELECTRIC TRACK DETECTORS/x radiation; ETCHING; PARTICLE TRACKS; POLYMERS; RADIATION DOSES

1808 (LA-UR–93-3811) **Temperature dependence of the radiation induced change of depletion voltage in silicon pin detectors.** Ziock, H.J. (Los Alamos National Lab., NM (United States)); Holzscheiter, K.; Morgan, A.; Palounek, A.P.T.; Ellison, J.; Heinson, A.P.; Mason, M.; Wimpenny, S.J.; Barberis, E.; Cartiglia, N.; Grillo, A.; O'Shaughnessy, K.; Rahn, J.; Rinaldi, P.; Rowe, W.A.Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931107–8: Nuclear science symposium, San Francisco, CA (United States), 2-5 Nov 1993). Order Number DE94002705. Source: OSTI; NTIS; INIS; GPO Dep.

The silicon microstrip detectors that will be used in the SDC experiment at the Superconducting Super Collider (SSC) will be exposed to very large fluences of charged particles, neutrons, and gammas. The authors present a study of how temperature affects the change in the depletion voltage of silicon PIN detectors damaged by radiation. They study the initial radiation damage and the short-term and long-term annealing of that damage as a function of temperature in the range from −10C to +50C, and as a function of 800 MeV proton fluence up to 1.5 × 10^{14} p/cm^2. They express the pronounced temperature dependencies in a simple model in terms of two annealing time constants which depend exponentially on the temperature.

1809 (SAND–92-2482C) **Interlaboratory verification of neutron spectra used for the testing of electronic parts.** Kelly, J.G. (Sandia National Labs., Albuquerque, NM (United States)); Griffin, P.J.; Raupach, D.C.; Daubenspect, T.H.; Bennion, J.S.; Newell, D.L. Sandia National Labs., Albuquerque, NM (United States). [1992]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930809–6: 8. ASTM-EURATOM symposium on reactor dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE93040757. Source: OSTI; NTIS; INIS; GPO Dep.

A methodology has been developed for verifying that a neutron energy spectrum measured for an environment correctly predicts the bulk displacement damage that would be observed in a silicon electronic device. The technique makes use of a package of silicon bipolar transistors (2N2222A), monitor activation foils (such as sulfur pellets), and thermoluminescence detectors (TLDs) that is placed in the test environment. The TLDs and monitors are then used to correct for the gamma-induced damage and to scale the reactor power in the test irradiation to that predicted by the neutron spectrum which is being verified. The damage predicted from the spectrum and the measured damage are then compared. In cases where the sensor set does not have sufficient sensitivity coverage to satisfactorily define the spectrum, the transistors can be used as spectrum sensors to provide sensitivity in the crucial energy region

between 0.1 and 2.0 MeV. This results in the loss of the independent verification, but leads in a much higher fidelity spectrum. The technique greatly facilitates inter- and intralaboratory comparisons of effects testing and spectrum determinations.

4404 Well Logging Instrumentation

1810 (DOE/CE/15500–T3) **Commercialization of atom interferometers for borehole gravity gradiometry: Quarterly report, April–June 1993.** Clauser, J.F. Clauser (John F.), Walnut Creek, CA (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG49-92CE15500. Order Number DE93019260. Source: OSTI; NTIS; GPO Dep.

Results are presented for the following tasks completed this quarter: study the influence of vibrations of the logging tool itself; compile a list of borehole imposed constraints and tradeoffs for the design of a gadiometer; and formulate the requirements for a magnet system and determine the feasibility for use of a combination of permanent magnets and electromagnets to produce the necessary fields.

4405 Thermal Instrumentation

Refer also to citation(s) 743, 1452

1811 (CONF-9305134–3-App.A) **Development of a dual-sinker densimeter for high-accuracy fluid P-V-T measurements: Appendix A.** McLinden, M.O.; Frederick, N.V. National Inst. of Standards and Technology, Boulder, CO (United States). Thermophysics Div. [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-88ER13823. From 11. symposium on energy engineering sciences; Argonne, IL (United States); 3-5 May 1993. Order Number DE93019682. Source: OSTI; NTIS; GPO Dep.

A dual-sinker densimeter to very accurately measure the pressure-volume-temperature (P-V-T) properties of fluids over a temperature range of 80 K to 520 K and at pressures up to 35 MPa is in the final stages of development at NIST. The density of a fluid is determined by measuring the difference in the buoyancy forces experienced by two sinkers of identical mass, surface area, and surface material, but very different volumes. The buoyancy forces on the sinkers are transmitted to a semi-microbalance by means of a magnetic suspension coupling. This paper reviews the principle of the measurement and describes the overall design of the system.

1812 (CONF-9309199–5) **Fiber optic temperature sensor using a Y_2O_2S:Eu thermographic phosphor.** Smith, T.V. (Bethel Coll., St. Paul, MN (United States). Dept. of Physics); Smith, D.B. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation; Boston, MA (United States); 7-10 Sep 1993. Order Number DE94000331. Source: OSTI; NTIS; GPO Dep.

This report details the development and testing of a thermographic-phosphor-based fiber-optic temperature sensor. The sensor is constructed by removing a region of the fiber jacket and cladding, then coating the exposed core with yttrium oxysulfide doped with a europium activator (Y_2O_2S:Eu). When photoexcited, the europium in the host lattice emits a sharp-line fluorescence spectrum that is characteristic of the temperature of the host crystal lattice. By measuring fluorescence lifetimes, we can deduce the temperature of an optical fiber that is in thermal contact with the fiber. Two different distributions of Y_2O_2S:Eu in the cladding region were evaluated with regard to light coupling efficiency. Theoretical waveguide calculations indicate that a thin core/cladding boundary distribution of Y_2O_2S:Eu couples light more efficiently into the cores guided modes than does a bulk distribution of phosphor in the cladding. The sensor tests showed reproducible response from 20 to 180 degrees Celsius. This technique has several advantages over other fiber optic temperature sensing techniques: the temperature measurement is independent of the strain applied to the fiber; the measurements are potentially accurate to within half a degree centigrade; the sensor allows temperature to be measured at precise locations; and the method doesn't preclude the use of the fiber for the simultaneous measurement of other parameters.

4406 Optical Instrumentation

Refer also to citation(s) 177, 1346, 1382, 1399, 1828, 1906

1813 (ORNL/TM–12383) **OTDR strain gauge for smart skins.** Kercel, S.W. Oak Ridge National Lab., TN (United States). Sep 1993. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93041043. Source: OSTI; NTIS; GPO Dep.

Optical time-domain reflectometry (OTDR) is a simple and rugged technique for measuring quantities such as strain that affect the propagation of light in an optical fiber. For engineering applications of OTDR, it is important to know the repeatable limits of its performance. The author constructed an OTDR-based, submillimeter resolution strain measurement system from off-the-shelf components. The systems repeatably resolves changes in time of flight to within ± 2 ps. Using a 1-m, single-mode fiber as a gauge and observing the time of flight between Fresnel reflections, a repeatable sensitivity of 400 microstrains was observed. Using the same fiber to connect the legs of a 3-dB directional coupler to form a loop, a repeatable sensitivity of 200 microstrains was observed. Realizable changes to the system that should improve the repeatable sensitivity to 20 microstrains or less are discussed.

1814 (UCRL-JC–114438) **Sodium-layer laser guide stars.** Friedman, H.W. Lawrence Livermore National Lab., CA (United States). 3 Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306245–1: North Atlantic Treaty Organization/Advanced Study Institute (NATO/ASI) conference on adaptive optics for astronomy, Cargese (France), 29 Jun - 9 aug 1993). Order Number DE93019621. Source: OSTI; NTIS; GPO Dep.

The requirements and design of a laser system to generate a sodium- layer beacon is presented. Early results of photometry and wavefront sensing are given.

4407 Geophysical and Meteorological Instrumentation

Refer also to citation(s) 39, 457

1815 (DOE/RL/12089–T2) **A field evaluation of remote sensor measurements of wind, temperature, and moisture for ARM integrated sounding system research.** Martner, B.E. (and others); Westwater, E.R.; Strauch, R.G. National Oceanic and Atmospheric Administration, Boulder, CO (United States). Wave Propagation Lab. [1993]. 110p. Sponsored by USDOE, Washington, DC (United States); National Oceanic and Atmospheric Administration, Washington, DC (United States). DOE Contract AI06-91RL12089 ;AI06-91RL12090 ;AI06-91RL12092. Order Number DE94000565. Source: OSTI; NTIS; GPO Dep.

Remote sensing systems were operated in Colorado in February and March 1991 to obtain detailed profiles of the kinematic and thermodynamic structure of the atmosphere for the US Department of Energy's Atmospheric Radiation Measurement (ARM) research program. The instruments included wind profilers, Radio Acoustic Sounding Systems (PASS), microwave and infrared radiometers, an infrared spectrometer, ceilometers, radiosondes, surface meteorological stations, and other equipment. A mesoscale data assimilation model will be used to combine the data into dynamically consistent four-dimensional fields as part of an integrated data assimilation sounding system. This report evaluates the performance of the NOAA remote sensors used in the 1991 field data collection. These included five different wind profilers, each equipped with RASS capability for temperature profiling, and microwave radiometers for measurements of pathintegrated water vapor and liquid water content. The design and initial testing of a Fourier-transform InfraRed Sounder (FIRS) for humidity profiling is also described. The ranges of height coverage and measurement accuracies for each wind profiler/RASS are examined. Specific recommendations for optimizing the design and configuration of similar instruments are made for the ARM cloud and Radiation

Testbed (CART) sites, based on results of the 1991 field work and earlier tests. Examples of routine processed data products are presented for three intensive operating period studies to further illustrate the remote sensors' capabilities.

1816 (WHC-SD-EN-RPT–005) **McGee Ranch CPT investigation.** Cassem, B.R. Westinghouse Hanford Co., Richland, WA (United States). 15 Jun 1993. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002493. Source: OSTI; NTIS; GPO Dep.

Applied Research Associated, Inc. (ARA), under contract to Argonne National Laboratory to perform work for Westinghouse Hanford Company (WHC), conducted Peizo Cone Penetration (P-CPT) Tests as part of an investigation of the fine-textured soils at the McGee Ranch Site. The purpose of the investigation was to characterize a potential borrow area for fine-textured soil materials that would be used to construct multi-layer closure covers on the Hanford Site. As part of the investigation, WHC conducted non auger-drill borings on the site during September 1992. ARA's objective was to characterize the soils at the McGee Ranch site using the cone penetrometer and compare the findings with the lithologic characterization obtained from geologic boring logs. This report documents ARA's site investigation efforts, test techniques, and analysis of the data for field work conducted April 14 and 15, 1993.

4408 Miscellaneous Instrumentation

Refer also to citation(s) 1, 467, 468, 474, 481, 739, 1220, 1223, 1398, 1847, 1853, 2085, 2328

1817 (ANL/FE/CP–80378) **Contact profilometry digital data acquisition and conversion.** Krieger, C.D. (Brigham Young Univ., Provo, UT (United States). Dept. of Electrical Engineering); Ley, H.; Westphal, B.R. Argonne National Lab., IL (United States). Jul 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931160–28: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94001322. Source: OSTI; NTIS; INIS; GPO Dep.

For many years the element contact profilometer in the Hot Fuel Examination Facility at Argonne National Laboratory in Idaho has served an important role in the post-irradiation examination of experimental and driver fuel elements irradiated in the Experimental Breeder Reactor-II or the Fast Fuel Test Facility. It measures the diameter over the length of irradiated elements. Using these data, an experimenter can determine how the physical shape of an element has changed due to in-reactor exposure. Previously, diameter measurements were mechanically registered on strip charts. Such data required manual entry into computers or calculators for subsequent quantitative analysis. Hand entry was time consuming, occasionally introduced typographical errors, and necessitated subjective interpretation ("eye-balling") of diameter strip charts. Furthermore, storing information on irregularly-sized strip charts made archiving difficult. Clearly, experimenters desired a way to eliminate these problems. A project was initiated to implement a cost-effective solution to the problems of the existing system, as well as convert presently stored paper strip charts to the new, digital format. To obtain new profilometry data in a machine-readable form, the ConPro digital data acquisition system was installed to operate concurrently with the existing equipment.

1818 (CONF-930405–40) **A quantitative model for interpreting nanometer scale hardness measurements of thin films.** Poisl, W.H. (Arizona Univ., Tucson, AZ (United States). Dept. of Materials Science and Engineering); Fabes, B.D.; Oliver, W.C. Oak Ridge National Lab., TN (United States); Oak Ridge Associated Universities, Inc., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;AC05-76OR00033. From Spring meeting of the Materials Research Society; San Francisco, CA (United States); 12-16 Apr 1993. Order Number DE93040601. Source: OSTI; NTIS; GPO Dep.

A model was developed to determine hardness of thin films from hardness versus depth curves, given film thickness and substrate hardness. The model is developed by dividing the measured hardness into film and substrate contributions based on the projected areas of both the film and substrate under the indenter. The model incorporates constraints on the deformation of the film by the surrounding material in the film, the substrate, and friction at the indenter/film and film/substrate interfaces. These constraints increase the pressure that the film can withstand and account for the increase in measured hardness as the indenter approaches the substrate. The model is evaluated by fitting the predicted hardness versus depth curves obtained from titanium and Ta_2O_5 films of varying thicknesses on sapphire substrates. The model is also able to describe experimental data for Ta_2O_5 films on sapphire with a carbon layer between the film and the substrate by a reduction in the interfacial strength from that obtained for a film without an interfacial carbon layer.

1819 (CONF-930796–4) **The laser and its applications on environment and biotechnology research.** Chen, C.H.; Chen, F.C. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1993 Chinese American Academic and Professional convention; Chicago, IL (United States); 2-5 Jul 1993. Order Number DE94000376. Source: OSTI; NTIS; GPO Dep.

During the past few years, researchers at ORNL have developed four new instruments involving the use of a laser for environmental and biotechnology research. They are: (1) a single atom detector, (2) a rare gas atom counter, (3) biopolymer mass spectrometer, and (4) a refrigerant ratiometer. Their basic principles and applications are briefly described in this paper.

1820 (DOE/ER/14244–1) **Development of synchrotron x-ray micro-spectroscopic techniques and application to problems in low temperature geochemistry: Progress report.** Chicago Univ., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER14244. Order Number DE94001375. Source: OSTI; NTIS; GPO Dep.

The focus of the technical development effort has been the development of apparatus and techniques for the utilization of X-ray Fluorescence (XRF), Extended X-ray Absorption Fine Structure (EXAFS) and X-ray Absorption Near Edge Structure (XANES) spectroscopies in a microprobe mode. The present XRM uses white synchrotron radiation (3 to 30 keV) from a bending magnet for trace element analyses using the x-ray fluorescence technique Two significant improvements to this device have been recently implemented. Focusing Mirror: An 8:1 ellipsoidal mirror was installed in the X26A beamline to focus the incident synchrotron radiation and thereby increase the flux on the sample by about a factor of 30. Incident Beam Monochromator: The monochromator has been successfully installed and commissioned in the X26A beamline upstream of the mirror to permit analyses with focused monochromatic radiation. The monochromator consists of a channel-cut silicon (111) crystal driven by a Klinger stepping motor translator. We have demonstrated the operating range of this instrument is 4 and 20 keV with 0.01 eV steps and produces a beam with a $\sim 10^{-4}$ energy bandwidth. The primary purpose of the monochromator is for x-ray absorption spectroscopy (XAS) measurements but it is also used for selective excitation in trace element microanalysis. To date, we have conducted XANES studies on Ti, Cr, Fe, Ce and U, spanning the entire accessible energy range and including both K and L edge spectra. Practical detection limits for microXANES are 10–100 ppM for 100 μm spots.

1821 (DOE/ER/79119–1) **A pressurized thermogravimetric analyzer for use in studies of gas/solid systems: First technical report.** Mitchell, R.E. Stanford Univ., CA (United States). High Temperature Gasdynamics Lab. 22 Sep 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-92ER79119. Order Number DE94001224. Source: OSTI; NTIS; GPO Dep.

A TG-151 Thermogravimetric Experimental Station, which measures and records weight changes of a solid material over a wide dynamic temperature range at a wide range of pressures in controlled environments, was purchased from Cahn Instruments, Inc. The TG-151 permits temperature to be programmed to follow a precise temperature profile of ramp and/or isothermal segments

while monitoring the changes in weight of solid samples exposed to a gaseous environment of specified composition at a preset pressure. Weight and temperature measurements are made at user-specified time intervals and total time (up to 48 hours). Data are stored on the disk of a dedicated computer. The data can be processed by a data analysis program or exported to spreadsheet programs. The pressure vessel is designed to operate in vacuum to 10^{-5} torr and over a wide range of pressures. At normal room temperature, the TG-151 can operate up to 100 atm and at 1273 K, it can operate up to 70 atm. The null balance has a sensitivity of 10 micrograms, capacity up to 100 grams, and a dynamic range of 10^6:1. Both reducing and oxidizing environments can be established in the reaction chamber. For our specific needs the instrument had to be slightly modified to allow for two reactant gas streams to enter the pressure vessel at prescribed times. This required the purchase and installation of a gas blending system. The gas blending system permits coal and char samples to be heated at a specified rate to a desired temperature in an inert environment before the sample is exposed to an oxidizing environment.

1822 (DOE/MC/11076–3411) **Indirect gas chromatographic measurement of water for process streams.** Barbour, F.A. Western Research Inst., Laramie, WY (United States). May 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE93011307. Source: OSTI; NTIS; GPO Dep.

This project was conducted to develop a moisture measurement method for process gas streams of fossil fuels. Objective was to from pyrolysis to measure the molar concentration of water in a gas stream without flow measurements. The method developed has been incorporated into the hydrocarbon gas analysis method currently used at Western Research Institute. A literature search of types of direct measuring moisture sensors was conducted, and a list of sensors available is given; most of them could not survive in the environment of the process streams. Indirect methods of measuring water involve changing the water via reaction to a compound that can be more readily measured. These methods react water with various reagents to form hydrogen, acetylene, and acetone. The method chose for this study uses a calcium carbide reaction column to convert the water present in the gas stream to acetylene for analysis. Relative deviation for the daily determination of water varied from 0.5 to 3.4%. The method chosen was tested for linearity over a wide range of gas stream water content. Response over 2 to 15 mole % water appears to be linear with a correlation coefficient of 0.991.

1823 (ETDE/JP-mf–94714745, pp. 74-81) **Take up the challenge to the ultimate target.: Optimization of vapor pressure control system.** 1992. 99p. In *Successful cases of energy conservation.* Order Number DE94714745. Source: OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

At the plant, steam is fed at 40 kg/cm^{2}g to each manufacturing equipment, except a portion of it, after generating electric power by the generator turbine, by allowing the boiler to produce 130 kg/cm^{2}g steam. In order to further improve energy/power saving, optimization of steam pressure control system was carried out. The new system was to optimize steam pressure control by combining the compressor turbine, generator turbine, and steam governing valve. This system consisted of four controlling functions as described bellow: function to control bleed pressure by means of the compressor turbine, that to control output together with controlling limit pressure by means of the generator turbine, that to control pressure by means of the steam governing valve, and that to control back pressure together with controlling output by means of the generator turbine. The compressor turbine, which was main machine of the manufacturing equipment used at the plant, played an important role. By this new system, increased output of the generator turbine and others were achieved, resulting in cost reduction of 80 million yen/year. 5 figs.

1824 (JINR-R–10-92-188) **The computer-aided system for the high resolution SQUID-magnetometer.** Litvinenko, E.I.; Obukhov, Yu.V.; Shatokhin, V.N.; Yakovenko, N.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 23p. (In Russian). Order Number DE94606138. Source: OSTI; NTIS (US Sales Only); INIS.

The described computer-aided system for the high resolution SQUID-magnetometer permits one to regulate the thermostat temperature, vary the working magnetic field, change the sample position and allow acquisition and processing of signal from a SQUID. A brief description of electronics and the principal program algorithms is proposed. 7 refs.; 6 figs.

1825 (LRAP–137) **Development of a heterodyne laser interferometer for very small high frequency displacements detection.** Baarmann, P. Lund Univ. (Sweden). Dept. of Physics; ABB Atom AB, Vaesteraas (Sweden). Oct 1992. 34p. Order Number DE94606140. Source: OSTI; NTIS; INIS.

Diploma work.

A heterodyne laser interferometer with detection electronics has been developed for measuring very small amplitude high frequency vibrations. A laser beam from HeNe-laser is focused and reflected in the vibrating surface and the generated phase shifts are after interference with a reference beam detected with a photo detector and evaluated in a demodulation system. The set-up is a prototype and techniques to improve the accuracy and sensitivity of the system are presented. The present system can detect vibration amplitude from around 1 Angstrom and is linear up to 250 Angstrom (±4%). Frequencies from a few tens of kHz up to tens of MHz are covered. The low frequency region can be greatly improved. The minimum detectable displacement may be improved by narrowing the bandwidth of the detection system to the region of interest.

1826 (NUREG/CR–6085) **United States National Seismographic Network.** Buland, R. (Geological Survey, Denver, CO (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Geological Survey, Denver, CO (United States). Sep 1993. 72p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). NRC-04-87-003. Source: OSTI; NTIS; INIS; GPO.

The concept of a United States National Seismograph Network (USNSN) dates back nearly 30 years. The idea was revived several times over the decades. but never funded. For, example, a national network was proposed and discussed at great length in the so called Bolt Report (U. S. Earthquake Observatories: Recommendations for a New National Network, National Academy Press, Washington, D.C., 1980, 122 pp). From the beginning, a national network was viewed as augmenting and complementing the relatively dense, predominantly short-period vertical coverage of selected areas provided by the Regional Seismograph Networks (RSN's) with a sparse, well-distributed network of three-component, observatory quality, permanent stations. The opportunity finally to begin developing a national network arose in 1986 with discussions between the US Geological Survey (USGS) and the Nuclear Regulatory Commission (NRC). Under the agreement signed in 1987, the NRC has provided $5 M in new funding for capital equipment (over the period 1987-1992) and the USGS has provided personnel and facilities to develop. deploy, and operate the network. Because the NRC funding was earmarked for the eastern United States, new USNSN station deployments are mostly east of 105°W longitude while the network in the western United States is mostly made up of cooperating stations (stations meeting USNSN design goals, but deployed and operated by other institutions which provide a logical extension to the USNSN).

1827 (SAND–93-1564C) **Acoustic, fiber optic, and silicon microelectronic microsensors research and development activities at Sandia National Laboratories.** Wiczer, J.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9310146–1: Sensors Expo conference, Philadelphia, PA (United States), 26-28 Oct 1993). Order Number DE93019075. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories, an 8500+ person, multiprogram research and development facility operated for the US Department of Energy, has over 400 research, development and applications scientists and engineers working on sensor technologies. Sandia's 20 person Microsensors Research and Development Department has invented, developed and fielded sensor systems based on acoustic, fiber optic, and silicon microelectronic technologies. These

sensors have been used for diverse applications inducting the monitoring of cleaning chemical concentrations in industrial process effluent streams, detection of explosive gas concentrations in aging industrial equipment, real-time measurements of fluid viscosity in equipment lubricants, and monitoring of contaminant concentration levels in ultrapure process gases. Representative sensor technologies available for technology transfer will be described including bulk acoustic wave resonators, surface acoustic wave devices, fiber optic micromirror sensors, and silicon microelectronic sensors.

1828 (SAND–93-1954C) **Gas sensor technology at Sandia National Laboratories: Catalytic gate, Surface Acoustic Wave and Fiber Optic Devices.** Hughes, R.C.; Moreno, D.J.; Jenkins, M.W.; Rodriguez, J.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309247–1: National Institute of Standards and Technology (NIST) workshop on gas sensors, Gaithersburg, MD (United States), 8-9 Sep 1993). Order Number DE94000557. Source: OSTI; NTIS; GPO Dep.

Sandia's gas sensor program encompasses three separate electronic platforms: Acoustic Wave Devices, Fiber Optic Sensors and sensors based on silicon microelectronic devices. A review of most of these activities was presented recently in a article in Science under the title "Chemical Microsensors." The focus of the program has been on understanding and developing the chemical sensor coatings that are necessary for using these electronic platforms as effective chemical sensors.

1829 (SAND–93-2155C) **Robust, Wide-Range Hydrogen Sensor for use in commercial, space, and government applications.** McWhorter, P.; Rodriguez, J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9306254–1: 10. world hydrogen energy conference, Cocoa Beach, FL (United States), 20-24 Jun 1993). Order Number DE93040902. Source: OSTI; NTIS; GPO Dep.

Short communication HYDROGEN/detection; MEASURING INSTRUMENTS/fabrication; HYDROGEN; DETECTION; FABRICATION; LEAKS; PRODUCTION; SENSITIVITY; PARAMETRIC ANALYSIS; SIZE; SAFETY

1830 (UCRL-ID–114904) **Portable Gas Chromatographic (GC)-Thermal Energy Analysis (TAE) design considerations.** Alcaraz, A.; Andresen, B.D.; Martin, W.; Hawley-Fedder, R. Lawrence Livermore National Lab., CA (United States). 1 Sep 1992. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94002614. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This paper addressed the overall concepts for the development of a portable GC-TEA instrumentation package. A reduction in size of at least four times from the commercial systems now available should be readily achieved. Major savings in size will be realized by designing the instrumentation specifically for a gas chromatographic interface, which includes changing the size of the ozone reaction chamber and coiling the furnace of the GC-pyrolysis unit into a smaller package. The results of the authors' efforts at miniaturization of a GC-TEA system will be a smaller, packaged instrument with lower power demands than existing instrumentation, while still maintaining the high performance detection characteristics of a full-size TEA system.

1831 (UCRL-JC–115215) **Inspection of the diamond-turned surfaces used for mounting an array of eight x-ray reflection gratings.** Montesanti, R.C. Lawrence Livermore National Lab., CA (United States). Nov 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9311102–1: American Society for Precision Engineering (ASPE) conference, Seattle, WA (United States), 7-12 Nov 1993). Order Number DE93040845. Source: OSTI; NTIS; GPO Dep.

This paper describes the use of a T-base diamond-turning machine as a measuring machine for inspecting the positional accuracy of the diamond-tuned surfaces of four attachment rails–parts that resemble precision step gauges. The attachment rails provide the precision mounting surfaces for a prototype array of eight X-ray reflection gratings for the European Space Agency's (ESA) X-ray Multi-Mirror project (XMM). Each rail is 4.5 in. long with a cross-section of less than 0.1 in^2, and has eight protruding bosses spaced approximately 0.5 in. apart (Figure 1). A diamond-turned feature on each boss provides a mounting surface for one of the four corners of a grating. These surfaces are 0.018 in. high by 0.1 in. wide, and have a 12 in. cylindrical radius with an axis parallel to the boss protrusion (Figure 2). Together, the four rails provide eight sets of four coplanar points for mounting the gratings (Figure 3). Note that the gratings are not parallel to each other; they sweep through a 12 mrad angle from the first to eighth grating. To accommodate this fanned array, the normal directions (denoted by arrows in Figure 1) of the mounting surfaces on the bosses, at the rail centerline, also sweep through a 12 mrad angle from the first to eighth boss.

1832 (WSRC-TR–91-435) **Instrument uncertainty predictions.** Coutts, D.A. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1991. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001396. Source: OSTI; NTIS; INIS; GPO Dep.

The accuracy of measurements and correlations should normally be provided for most experimental activities. The uncertainty is a measure of the accuracy of a stated value or equation. The uncertainty term reflects a combination of instrument errors, modeling limitations, and phenomena understanding deficiencies. This report provides several methodologies to estimate an instrument's uncertainty when used in experimental work. Methods are shown to predict both the pretest and post-test uncertainty.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

Refer also to citation(s) 480, 483, 2870

1833 (LA–12296-MS) **Miss distances in tactical missile intercepts.** Canavan, G.H. Los Alamos National Lab., NM (United States). Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001571. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Endoatmospheric tactical missiles are hard to hit because their response to their environment may not be too different from optimal escape maneuvers. For varying or random accelerations, optimal guidance could increase errors. Maneuvering missiles, weapons, and debris are also hard to hit. Breaking up could cause erratic motions of the target in about the same frequency range as optimal evasive maneuvers.

1834 (LA-SUB–93-311) **AR-70-XX, management of computer resources in Battlefield Automated Systems, analysis: Final report for period 15 January 1988–15 June 1988.** Cooper, J.D. (Anchor Software Management, Falls Church, VA (United States)). Los Alamos National Lab., NM (United States). 15 Jun 1988. 24p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002565. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This final report is submitted in satisfaction of Task 2 of Anchor Software Management efforts required under Los Alamos Subcontract 9-X48-91169-1. Task 2 required Anchor Software Management to perform an analysis of Army Regulation 70-XX (draft). The purpose of the analysis was twofold, to ensure that software life cycle supportability issues were adequately addressed and to provide recommendations for improvements to the document. Early in the effort the Army restructured the document by changing it from an Army Regulation to an Army Materiel Command Regulation. While it's scope was reduced to the Army Materiel Command, all other aspects of the document remained the same. As a result of this change, Anchor Software Management was asked to shape the results of their effort in the form of a new draft of the document, AMC-R 70-16A. Attachment 1 represents the result of their effort and is the new draft AMC-R 70-16A that was circulated for their coordination.

1835 (ORNL/SUB–93-SL161) **Datamatrix and PDF417 data integrity test.** Fales, J.F. (Ohio Univ., Athens, OH (United States).

Center for Automatic Identification Education and Research); Vincent, R.S. Oak Ridge National Lab., TN (United States); Ohio Univ., Athens, OH (United States). Center for Automatic Identification Education and Research. Sep 1993. 46p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001118. Source: OSTI; NTIS; GPO Dep.

We conducted a test to evaluate data integrity of selected two-dimensional, high-density, high-capacity coding symbologies for use in selected automatic identification applications. The test was part ot the US Army's Project Manager for Annnunition Logistics Automatic Ammunition Identification Technology Project. Specific symbologies tested were Datamatrix, from International Data Matrix, Inc., and PDF417, from Symbol Technologies, Inc. As a reference, Code 39 symbology was also evaluated under the same conditions. The statistical objective of the test was to determine if Datamatrix and/or PDF417 symbologies could be expected to exhibit one error or less in two million characters scanned and decoded. The level of confidence was set to 95%. Symbols for Datamatrix and PDF417 included 50, 100, 250, and 350 encoded characters for each of three levels or error correction. Each Code 39 symbol contained 15 to 25 characters. Based on a population of 1080 symbols per symbology, sample size was calculated to be 31,438,998 characters per symbology. An automated test apparatus was used to assure uniformity of test conditions. The apparatus included robotic loading and unloading of carrier sheets onto scanning stations. Scanning for Datamatrix symbols was performed using fixed mounted RS-170 CCD cameras. PDF417 and Code 39 symbols were scanned using hand-held rastering visible laser scanners mounted in fixed positions and software triggered. Decoding of all symbols occurred in decoders supplied with the scanners using the respective manufacturer's proprietary decoding algorithms. Over 94 million characters were decoded during the test. Analysis of test results indicate no errors attributable to either Datamatrix or PDF417 symbologies. Eleven errors were recorded for Code 39.

1836 (SAND–93-1673) **Defense programs: A Sandia weapon review bulletin.** Sandia National Labs., Albuquerque, NM (United States). Sum 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94002476. Source: OSTI; NTIS; GPO Dep.

Sandia's mission to explore technology that enhances US nuclear weapons capabilities has been the primary impetus for the development of a class of inertial measurement units not available commercially. The newest member of the family is the Ring Laser Gyro Assembly. The product of a five-year joint effort by Sandia and Honeywell's Space and Strategic Systems Operation, the RLGA is a small, one-nautical-mile-per-hour-class inertial measurement unit that consumes only 16 watts - attributes that are important to a guidance and control capability for new or existing weapons. These same attributes led the Central Inertial Guidance Test Facility at Holloman Air Force Base to select the RLGA for their newest test instrumentation pod. The RLGA sensor assembly is composed of three Honeywell ring laser gyroscopes and three Sundstrand Data Control accelerometers that are selected from three types according to the user's acceleration range and accuracy needs.

1837 (SAND–93-1965C) **A qualified radiation hardened nonvolatile memory for space and tactical weapons applications.** Marthinuss, J. (Westinghouse Electric Corp., Baltimore, MD (United States). Advanced Technology Div.); Williams, D.; Bishop, R.; Jacunski, M.; Adams, D.; Jakubzcak, J.; Gentry, F.; McClintock, R.; White, E.; Murray, J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9311101–1: GOMAC 93: government microcircuit application conference, New Orleans, LA (United States), 1-4 Nov 1993). Order Number DE94001211. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A radiation hardened 64K CMOS SONOS full featured EEPROM, W28C64, is available. A team of Sandia National Laboratories and Westinghouse Advanced Technology Division personnel successfully transitioned a development program into a production ready, radiation hardened nonvolatile memory product qualified for satellite (space), tactical weapons, and commercial systems. The part is software compatible with commercial 64K EEPROMs and is presently being offered with Class B, Class S and commercial screening. A data sheet for W28C64 is available.

1838 (UCRL-ID–114812) **Data compression enhancements to the distributed interactive simulation protocol for use by entity-level simulations.** Powell, E.T. Lawrence Livermore National Lab., CA (United States). 24 Jun 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000957. Source: OSTI; NTIS; GPO Dep.

A series of new Protocol Data Units (PDUs) that send only limited entity-state information over a distributed Interactive Simulation (DIS) network is described. These PDUs are tailored specifically to simulations that model numerous entities rather than simulator modeling a single entity. The use of these new PDUs could (under certain circumstances) realize compression factors of 16, 32, or up to 1200 to one in the amount of data that needs to be sent over a DIS network.

1839 (UCRL-JC–112683) **Computer simulations to study the effect of adiabatic heating on rod penetration.** Reaugh, J.E. Lawrence Livermore National Lab., CA (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309224–1: Ballistics 93: 14. international symposium on ballistics, Quebec (Canada), 26-29 Sep 1993). Order Number DE93019625. Source: OSTI; NTIS; GPO Dep.

We use computer simulations to help us understand the experimental observation that depleted uranium (DU) rods penetrate more steel than equal density tungsten alloy (WA) rods, and that this advantage depends on velocity and fineness ratio. Our simulations used thermal softening. Although the DU rods exhibit shear fracture instead, both phenomena result in a loss of hoop strength, and help to keep the projectile residue from interfering with the incoming rod. Our simulations show that rods of DU (or other alloy with strong thermal softening) penetrate more steel than rods of WA (for alloys with little thermal softening), and show velocity and fineness ratio dependencies that are in qualitative agreement with experiment.

1840 (UCRL-JC–114065) **Advanced technologies for remote sensing imaging applications.** Wood, L.L. Lawrence Livermore National Lab., CA (United States). 7 Jun 1993. 28p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306163–3: Items '93: an imaging technology conference and exposition, Washington, DC (United States), 6-10 Jun 1993). Order Number DE94001063. Source: OSTI; NTIS; GPO Dep.

Generating and returning imagery from great distances has been generally associated with national security activities, with emphasis on reliability of system operation. (While the introduction of such capabilities was usually characterized by high levels of innovation, the evolution of such systems has followed the classical track of proliferation of "standardized items" expressing ever more incremental technological advances.) Recent focusing of interest on the use of remote imaging systems for commercial and scientific purposes can be expected to induce comparatively rapid advances along the axes of efficiency and technological sophistication, respectively. This paper reviews the most basic reasons for expecting the next decade of advances to dwarf the impressive accomplishments of the past ten years. The impact of these advances clearly will be felt in all major areas of large-scale human endeavor, commercial, military and scientific.

4501 Chemical Explosions and Explosives

Refer also to citation(s) 1055, 1805

1841 (CONF-9306110–2) **Indicator strip and portable instrument technologies for determining nitroesters or moisture in combustible cartridge cases.** Griest, W.H.; Ho, C.H.; Moneyhun, J.H.; Agouridis, D.C.; Gayle, T.M.; Bates, B.E. Oak Ridge National Lab., TN (United States). [1993]. 15p. Sponsored by Department of Defense, Washington, DC (United States). DOE

Contract AC05-84OS21400. Agreement 1892-A078-A1. From 1993 predictive technology symposium and exhibition; Orlando, FL (United States); 22-24 Jun 1993. Order Number DE94000481. Source: OSTI; NTIS; GPO Dep.

The sometimes large round-to-round variability observed in accelerated environmental testing, plus difficulties in quantifying the environmental histories of a given round suggest the need for nondestructive rapid tests of munitions to supplement lifetime prediction models in quality assurance of munitions. Technologies are being developed for reagent strips which can be affixed to rounds and which will visually indicate the presence and extent of nitroester migration by a visible color change. A solid state adaptation of a modified Griess reagent develops a red-purple color in the presence of nitroesters. Performance of current designs tested in the laboratory suggest a short-term (ca. one month) single usage. Dielectric capacitance is a promising means for rapid, nondestructive moisture determinations using a portable battery-powered instrument. Laboratory studies with a modified, inexpensive, commercial device have demonstrated fast (a few seconds) detection of case wall moisture content.

1842 (LA-SUB–93-299) **Investigations on detonation shock dynamics and related topics: Final report for DOE-LANL-9-XG8-3931P-1.** Stewart, D.S. (Univ. of Illinois, Urbana, IL (United States). Dept. of Theoretical and Applied Mechanics). Los Alamos National Lab., NM (United States); Illinois Univ., Urbana, IL (United States). Dept. of Theoretical and Applied Mechanics. [1993]. 308p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002570. Source: OSTI; NTIS; GPO Dep.

This document is a final report that summarizes the research findings and research activities supported by the subcontract DOE-LANL-9-XG8-3931P-1 between the University of Illinois (D. S. Stewart Principal Investigator) and the University of California (Los Alamos National Laboratory, M-Division). The main focus of the work has been on investigations of Detonation Shock Dynamics. A second emphasis has been on modeling compaction of energetic materials and deflagration to detonation in those materials. The work has led to a number of extensions of the theory of Detonation Shock Dynamics (DSD) and its application as an engineering design method for high explosive systems. The work also enhanced the hydrocode capabilities of researchers in M-Division by modifications to CAVEAT, an existing Los Alamos hydrocode. Linear stability studies of detonation flows were carried out for the purpose of code verification. This work also broadened the existing theory for detonation. The work in this contract has lead to the development of one-phase models for dynamic compaction of porous energetic materials and laid the groundwork for subsequent studies. Some work that modeled the discrete heterogeneous behavior of propellant beds was also performed. The contract supported the efforts of D. S. Stewart and a Postdoctoral student H. I. Lee at the University of Illinois.

1843 (LA-UR–93-2343) **Crystal orientation dependence of elastic precursor strength in pentaerythritol tetranitrate.** Dick, J.J.; Whitehead, M.C.; Martinez, A.R. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930676–23: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE93018340. Source: OSTI; NTIS; GPO Dep.

Elastic precursor shock strengths were measured using VISAR instrumentation on pentaerythritol tetranitrate crystals 2.9 to 6.4 mm thick. Input shock strength was 1.2 GPa. A factor of 3 difference in elastic shock strength and a factor of 2 difference in critical resolved shear stress were observed depending on the crystal orientation. The order of increasing elastic shock strength was [100], [101],[110], and [001]. This is the same order as that obtained in our analysis for increasing steric hindrance to shear, indicating that the relative strength of different orientations of this molecular crystal under shock conditions is governed by steric hindrance to shear.

1844 (LA-UR–93-2344) **Unreacted Hugoniots for porous and liquid explosives.** Gustavsen, R.L.; Sheffield, S.A. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930676–22: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE93018339. Source: OSTI; NTIS; GPO Dep.

Numerous authors have measured the Hugoniots of a variety of granular explosives pressed to different densities. Each explosive at each density was typically then treated as a unique material having its own Hugoniot. By combining methods used by Hayes, Sheffield and Mitchell (for describing the Hugoniot of HNS at various densities) with Hermann's P-α model, it is only necessary to know some thermodynamic constants or the Hugoniot of the initially solid material and the porous material sound speed to obtain accurate unreacted Hugoniots for the porous explosive. We discuss application of this method to several materials including HMX, PETN, TNT, and Tetryl, as well as HNS. We also show that the "Universal Liquid Hugoniot" can be used to calculate the unreacted Hugoniot for liquid explosives. With this method only the ambient pressure sound speed and density are needed to predict the Hugoniot. Applications presented include nitromethane and liquid TNT.

1845 (LA-UR–93-2904) **Temperature-dependent shock initiation of TATB-based high explosives.** Dallman, J.C.; Wackerle, J. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930713–28: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94000809. Source: OSTI; NTIS; GPO Dep.

The effects of temperature on the shock sensitivity of two TATB formulations PBX 9502 and LX-17 are studied over the temperature range −54°C to 252°C. The shock Hugoniot curves over this same temperature range are developed. Thermal expansion properties and porosities are used to help determine the mechanisms of thermal sensitization. Impact sensitivities over the range from ambient to 300°C are reported. Analyses of these results imply that thermal sensitization is the result of purely chemical kinetics enhancement and intracrystalline hot-spot growth. Additional results on the ambient shock sensitivity of PBX 9502 and LX-17 following thermal cycling to 252°C and back to ambient is presented.

1846 (ORNL/TM–12405) **Prototype indicator strip for tank ammunition: Final report.** Bates, B.; Griest, W. Oak Ridge National Lab., TN (United States). 31 Oct 1993. 61p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001801. Source: OSTI; NTIS; GPO Dep.

Combustible nitrocellulose ordnance casings offer advantages of: light weight, low cost, low detectability, and quick cycling of rounds by immediate disposal. However, mechanical strength is degraded with time by the action of humidity and nitroester diffusion through the casing to adhesives. The primary development effort of this study is a means to detect nitroester migration to the crucial skive joint which binds an assortment of warhead choices to propellant casings. This work has developed a prototype colorimetric indicator strip which, when applied in a field environment, produces a purple tint proportional to casing nitroester concentration, and inversely proportional to remaining adhesive joint strength. This work addressed the three steps in indicator strip use: (1) A suggested protocol for indicator strip preparation was developed. Various coatings, support reagents, and backings were examined resulting in a choice of polyethylene tape coating over separate AB- and C-impregnated cellulose punches. Various methods of punch creation and impregnation were tried resulting in stirred aqueous solutions and suspensions of AB and C, respectively. (2) Suggested protocols for indicator strip application to lab backings and field casings were developed. After chemical stripper was applied to the alumina-polyurethane paint on casings, C and AB punches were stacked and double-tape sealed. (3) A means for indicator strip monitoring was developed. From known time of indicator reaction, casing humidity, and indicator color, a means for field concentration determination was determined. Lab time-lapse photography was used to calibrate the indicator at a single level of humidity.

1847 (ORNL/TM–12434) **Atmospheric sampling glow discharge ionizataion and triple quadrupole tandem mass spectrometry for explosives vapor detection.** McLuckey, S.A.; Goeringer, D.E.; Asano, K.G.; Hart, K.J.; Glish, G.L.; Grant, B.C.; Chambers, D.M. Oak Ridge National Lab., TN (United States). Aug 1993. 166p. Sponsored by Federal Aviation Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93040593. Source: OSTI; NTIS; GPO Dep.

The detection and identification of trace vapors of hidden high explosives is an excellent example of a targeted analysis problem. It is desirable to push to ever lower levels the quantity or concentration of explosives material that provides an analytical signal, while at the same time discriminating against all other uninteresting material. The detection system must therefore combine high sensitivity with high specificity. This report describes the philosophy behind the use of atmospheric sampling glow discharge ionization, which is a sensitive, rugged, and convenient means for forming anions from explosives molecules, with tandem mass spectrometry, which provides unparalleled specificity in the identification of explosives-related ions. Forms of tandem mass spectrometry are compared and contrasted to provide a summary of the characteristics to be expected from an explosives detector employing mass spectrometry/mass spectrometry. The instrument developed for the FAA, an atmospheric sampling glow discharge/triple quadrupole mass spectrometer, is described in detail with particular emphasis on the ion source/spectrometer interface and on the capabilities of the spectrometer. Performance characteristics of the system are also described as they pertain to explosives of interest including a description of an automated procedure for the detection and identification of specific explosives. A comparison of various tandem mass spectrometers mated with atmospheric sampling glow discharge is then described and preliminary studies with a vapor preconcentration system provided by the FAA will be described.

1848 (UCRL-JC–107192) **Dusty boundary layer in a surface-burst explosion.** Kuhl, A.L. (Lawrence Livermore National Lab., El Segundo, CA (United States)); Ferguson, R.E.; Chien, K.Y.; Collins, J.P. Lawrence Livermore National Lab., El Segundo, CA (United States). Aug 1993. 15p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. Agreement DNA IACRO 92-824;Contract RDA-TR-88-C-0046. (CONF-9309234–1: Military application of blast simulation, The Hague (Netherlands), 13-17 Sep 1993). Order Number DE93040846. Source: OSTI; NTIS; GPO Dep.

Dusty boundary layers are an inherent feature of explosions over ground surfaces. Detailed knowledge of dusty boundary layer characteristics is needed in explosion safety analysis (e.g., to calculate the drag loads on structures). Also, to predicct the amount of dust in the rising fireball of an explsion, one must know the dusty boundary layer swept up during the positive and negative phases of the blast wave and how much of this boundary layer dust is entrained into the stem of the dust cloud. This paper describes the results of numerical simulations of the dusty boundary layer created by a surface burst explosion. The evolution of the flow was calculated by a high-order Godunov code that solves the nonsteady conservation laws.

1849 (UCRL-JC–111337) **Shock sensitivity of IHE at elevated temperatures.** Urtiew, P.A.; Cook, T.M.; Maienschein, J.L.; Tarver, C.M. Lawrence Livermore National Lab., CA (United States). Jun 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930713–25: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94000386. Source: OSTI; NTIS; GPO Dep.

Insensitive high explosives (IHE's) based on triaminotrinitrobenzene (TATB) have been demonstrated to be very insensitive to shock, thermal, friction and other stimuli. Hazard scenarios can involve more than one stimulus, such as heating followed by fragment impact (shock). The shock sensitivity of the IHE's LX-17 and PBX-9502 preheated to a temperature (250°C) just below thermal runaway is quantitatively studied using embedded manganin pressure gauges. The thermal expansion of TATB to 250°C is measured to determine the state of the explosive prior to shock initiation. LX-17 and PBX-9502 are found to be significantly more sensitive at 250°C than at lower temperatures, but still less sensitive than ambient temperature HMX-based explosives. An ignition and growth reactive flow computer model of the shock initiation of hot IHE is developed to allow predictions of the response of hot IHE to impact scenarios which can not be tested directly.

1850 (UCRL-JC–111342) **Multiple shock initiation of LX-17.** Tarver, C.M.; Cook, T.M.; Urtiew, P.A.; Tao, W.C. Lawrence Livermore National Lab., CA (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930713–30: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94001524. Source: OSTI; NTIS; GPO Dep.

The response of the insensitive TATB-based high explosive LX-17 to multiple shock impacts is studied experimentally in a four inch gas gun using embedded manganin gauges and numerically using the ignition and growth reactive flow model of shock initiation and detonation. Pressure histories are reported for LX-17 cylinders which are subjected to sustained shock pulses followed by secondary compressions from shocks reflected from metal discs attached to the backs of the explosive targets. These measured and calculated pressure histories show that the threshold for hot spot growth in LX-17 is 7 GPa, that LX-17 can be dead pressed at slightly lower pressures, and that the reaction rates behind reflected shocks increase greatly as the impedance of the metal increases. A study of the response of LX-17 to the collision of two reacting, diverging shocks forming a Mach stem wave inside the LX-17 charge demonstrated that this interaction can result in a high pressure region of sufficient size and strength to cause detonation under certain conditions.

1851 (UCRL-JC–111343) **Energy transfer in solid explosives.** Tarver, C.M.; Fried, L.E.; Ruggiero, A.J.; Calef, D.F. Lawrence Livermore National Lab., CA (United States). Jul 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930713–32: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94001523. Source: OSTI; NTIS; GPO Dep.

The nonequilibrium Zeldovich-von Neumann-Doring theory of detonation in solid explosives is extended to include recent nanosecond and picosecond experimental and theoretical results on each of the four main regions of the reaction zone. The first region is the three-dimensional, Mach stem dominated leading shock front which excites the phonon modes of the explosive molecules in less than a picosecond. The second region is the multiphonon up-pumping process in which the excited phonons anharmonically couple to the low frequency (doorway) vibrational modes which in turn equilibrate with the higher frequency modes by internal vibrational redistribution. This process may require on the order of tens of picoseconds. The third region is the chemical reconstitution region in which the vibrationally equilibrated transition state decomposes in a series of chain reaction steps into highly vibrationally excited diatomic and triatomic molecules in approximately one nanosecond. The fourth region is dominated by vibrational deexcitation and solid species formation as chemical and thermal equilibrium is approached. This is the region measured by current nanosecond resolution techniques and can last from nanoseconds to microseconds depending on the oxygen balance of the solid explosive.

1852 (UCRL-JC–111897) **Blast wave from buried charges.** Reichenbach, H. (Fraunhofer-Institut fuer Kurzzeitdynamik - Ernst-Mach-Institut (EMI), Freiburg im Breisgau (Germany)); Behrens, K.; Kuhl, A.L. Lawrence Livermore National Lab., CA (United States). Aug 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309234–2: Military application of blast simulation, The Hague (Netherlands), 13-17 Sep 1993). Order Number DE93041349. Source: OSTI; NTIS; GPO Dep.

While much airblast data are available for height-of-burst (HOB) effects, systematic airblast data for depth-of-burst (DOB) effects are more limited. It is logical to ask whether the spherical 0.5-g Nitropenta charges that, proved to be successful for HOB tests at EMI are also suitable for experiments with buried charges in the laboratory scale; preliminary studies indicated in the alternative. Of

special interest is the airblast environment generated by detonations just above or below the around surface. This paper presents a brief summary of the test results.

1853 (UCRL-JC–113252) **Signal predictions for a proposed fast neutron interrogation method.** Sale, K.E. Lawrence Livermore National Lab., CA (United States). Dec 1992. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310164–1: International symposium on substance identification technologies, Innsbruck (Austria), 4-8 Oct 1993). Order Number DE93040538. Source: OSTI; NTIS; INIS; GPO Dep.

We have applied the Monte Carlo radiation transport code COG) to assess the utility of a proposed explosives detection scheme based on neutron emission. In this scheme a pulsed neutron beam is generated by an approximately seven MeV deuteron beam incident on a thick Be target. A scintillation detector operating in the current mode measures the neutrons transmitted through the object as a function of time. The flight time of unscattered neutrons from the source to the detector is simply related to the neutron energy. This information along with neutron cross section excitation functions is used to infer the densities of H, C, N and O in the volume sampled. The code we have chosen to use enables us to create very detailed and realistic models of the geometrical configuration of the system, the neutron source and of the detector response. By calculating the signals that will be observed for several configurations and compositions of interrogated object we can investigate and begin to understand how a system that could actually be fielded will perform. Using this modeling capability many early on with substantial savings in time and cost and with improvements in performance. We will present our signal predictions for simple single element test cases and for explosive compositions. From these studies it is dear that the interpretation of the signals from such an explosives identification system will pose a substantial challenge.

1854 (UCRL-JC–113394) **Chemical conversion of energetic materials to higher value products.** Mitchell, A.R.; Sanner, R.D. Lawrence Livermore National Lab., CA (United States). Mar 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930681–3: 24. international annual conference of the Fraunhofer Institute of Chemical Technologies, Karlsruhe (Germany), 29 Jun - 2 jul 1993). Order Number DE93041346. Source: OSTI; NTIS; GPO Dep.

Objective of this program is to examine new routes for disposal of energetic materials, as there is need to reduce the stockpile of conventional munitions. Disposal through destruction (burning, detonation) is less feasible today due to environmental, cost and safety concerns. Chemical conversion of energetic materials to higher value products useful in civilian and military applications is one area being explored. Initial focus has been on the conversion of TNT to other materials. Reduction of TNT to aminodinitrotoluenes, diaminonitrotoluenes and triaminotoluene is well known. Conversion of these TNT reduction products to corresponding iminodiacetic acid derivatives by N-dialkylation with chloroacetic acid should provide chelators of heavy metals. The preparation and characterization of chelating resins derived from TNT-related molecules and polystyrene are described.

1855 (UCRL-JC–113400) **Computer simulation of molecular response at a shock front.** Belak, J. Lawrence Livermore National Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–60: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001050. Source: OSTI; NTIS; GPO Dep.

Molecular dynamics simulations of the response of small molecules at a shock front are presented. The simulations are performed in the reference frame of the shock and the results provide a unique insight into the sequence of states through which the material transforms during shock loading. The calculated up-pumping time (time for the translational and vibrational kinetic energy to equilibrate) for small molecules is quite fast, a few picoseconds for butane and about 10 ps for nitromethane. This is somewhat faster than the 100 ps suggested by a recent experiment.

1856 (UCRL-JC–114109) **Condensed-phase thermal decomposition of TATB investigated by atomic force microscopy (AFM) and simultaneous thermogravimetric modulated beam mass spectrometry (STMBMS).** Land, T.A. (Lawrence Livermore National Lab., CA (United States)); Siekhaus, W.J.; Foltz, M.F.; Behrens, R. Jr. Lawrence Livermore National Lab., CA (United States). May 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930713–27: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94000396. Source: OSTI; NTIS; INIS; GPO Dep.

A combination of techniques has been used to investigate the condensed-phase thermal decomposition of TATB. STMBMS has been used to identify the thermal decomposition products and their temporal correlation's. These experiments have shown that the condensed-phase decomposition proceeds through several autocatalytic pathways. Both low and high molecular weight decomposition products have been identified. Mono-, di- and tri-furazans products have been identified and, their temporal behaviors are consistent with a stepwise loss of water. AFM has been used to correlate the decomposition chemistry with morphological changes occurring as a function of heating. Patches of small 25-140 nm round holes were observed throughout the lattice of TATB crystals that were heated briefly to 300C. It is likely that these holes show where decomposition reactions have started. Evidence of decomposition products have been seen in TATB that has been held at 250C for one hour.

1857 (UCRL-JC–114201) **The ignition temperature of solid explosives exposed to a fire.** Creighton, J.R. Lawrence Livermore National Lab., CA (United States). Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303221–2: Probabilistic safety assessment and management (PSAM) conference, San Diego, CA (United States), 20-24 Mar 1993). Order Number DE94001047. Source: OSTI; NTIS; GPO Dep.

When a system containing solid explosive is engulfed in a fire it receives a heat flux that causes the temperature of the system to rise monotonically. The temperature rise can often be approximated by a linear rise for extended periods of time. When some portion of the explosive, usually near the surface, reaches its ignition temperature it will begin to burn. If the explosive is unconfined, or can breach its confinement at low pressure, it will burn, not explode. Typically the burn front will propagate through a slab or shell at speeds on the order of a centimeter a minute. If the explosive is confined, the gas resulting from its burning will generate pressures high enough to rupture the confinement, but the peak pressure will generally be only a fraction of the pressure from a true detonation. When a system is not engulfed in the fire, but is close enough to be heated slowly by the fire, the behavior will be different. If the explosive is heated slowly it will have a nearly uniform temperature and ignition will occur inside the explosive. This almost always causes an explosion, even when the explosive as a whole is unconfined. The reason for this behavior is not well understood but slow heating of an explosive generally results in a more violent explosion than fast heating. These two situations are recognized by fast and slow cookoff tests used with munitions. Many munitions pass the fast cookoff test with heating rates around 2 K/min. Slow cookoff tests with heating rates around 4 K/hr generally result in an explosion. (The equations in this paper assume absolute temperatures in Kelvins, equal to Celsius + 273.16.) Mathematical models predicting the time to explosion are usually based on the assumption that the explosive has a uniform initial temperature and that the outer surface is suddenly raised to some temperature and held there. The earliest such models where those of Semenov and Frank-Kamenetskii.

1858 (UCRL-JC–114577) **Weak-shock reflection factors.** Reichenbach, H. (Ernst Mach Inst., Freiburg (Germany)); Kuhl, A.L. Lawrence Livermore National Lab., CA (United States). 7 Sep 1993. 14p. Sponsored by Defense Nuclear Agency, Washington, DC (United States). DOE Contract W-7405-ENG-48. Agreement DNA-IACRO 92-824;Contract DNA 001-91-C-0039. (CONF-9309234–3: Military application of blast simulation, The Hague (Netherlands), 13-17 Sep 1993). Order Number DE94001768. Source: OSTI; NTIS; GPO Dep.

The purpose of this paper is to compare reflection factors for weak shocks from various surfaces, and to focus attention on some unsolved questions. Three different cases are considered: square-wave planar shock reflection from wedges; square-wave planar shock reflection from cylinders; and spherical blast wave reflection from a planar surface. We restrict ourselves to weak shocks. Shocks with a Mach number of $M_O < 1.56$ in air or with an overpressure of $\Delta p_I < 25$ psi (1.66 bar) under normal ambient conditions are called weak.

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Refer also to citation(s) 982, 1402, 1463, 1944

1859 (DOE/NV–209-Rev.13) **Announced United States nuclear tests, July 1945–December 1992: Revision 13.** USDOE Nevada Operations Office, Las Vegas, NV (United States). Office of External Affairs. May 1993. 112p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93016551. Source: OSTI; NTIS; INIS; GPO Dep.

This document lists chronologically and alphabetically by event name all nuclear tests conducted and announced by the United States from July 1945 through December 1992, with the exception of the GMX experiments. The 24 GMX experiments, conducted at the Nevada Test Site (NTS) between December 1954 and February 1956, were "equation-of-state" physics studies that used small chemical explosives and small quantities of plutonium. Several tests conducted during Operation Dominic involved missile launches from Johnston Atoll. Several of these missile launches were aborted, resulting in the destruction of the missile and nuclear device either on the pad or in the air.

1860 (JAB–10733-2) **Seismic Safety Program: Ground motion and structural response.** URS/John A. Blume and Associates, Engineers, San Francisco, CA (United States). May 1993. 332p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-89NV10733. Order Number DE94001092. Source: OSTI; NTIS; GPO Dep.

In 1964, John A. Blume & Associates Research Division (Blume) began a broad-range structural response program to assist the Nevada Operations Office of the US Atomic Energy Commission (AEC) in ensuring the continued safe conduct of underground nuclear detonation testing at the Nevada Test Site (NTS) and elsewhere. Blume's long experience in earthquake engineering provided a general basis for the program, but much more specialized knowledge was required for the AEC's purposes. Over the next 24 years Blume conducted a major research program to provide essential understanding of the detailed nature of the response of structures to dynamic loads such as those imposed by seismic wave propagation. The program's results have been embodied in a prediction technology which has served to provide reliable advanced knowledge of the probable effects of seismic ground motion on all kinds of structures, for use in earthquake engineering and in building codes as well as for the continuing needs of the US Department of Energy's Nevada Operations Office (DOE/NV). This report is primarily an accounting of the Blume work, beginning with the setting in 1964 and the perception of the program needs as envisioned by Dr. John A. Blume. Subsequent chapters describe the structural response program in detail and the structural prediction procedures which resulted; the intensive data acquisition program which, as is discussed at some length, relied heavily on the contributions of other consultant-contractors in the DOE/NV Seismic Safety Support Program; laboratory and field studies to provide data on building elements and structures subjected to dynamic loads from sources ranging from testing machines to earthquakes; structural response activities undertaken for testing at the NTS and for off-NTS underground nuclear detonations; and concluding with an account of corollary studies including effects of natural forces and of related studies on building response.

1861 (KCP–613-5077) **Particle migration through sealed bearings.** Sundvold, P.D. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Aug 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE93040854. Source: OSTI; NTIS; GPO Dep.

Tests were performed to determine the ability of various types of shielded bearings to isolate particulate from a clean environment in support of the Direct Optical Initiation (DOI) program. In the DOI firing system, a stronglink mechanism will share the same environment with a high-powered laser which needs uncontaminated optics to perform properly. Two commercially available shielded and sealed bearings were tested along with a sealed bearing designed at Allied Signal Inc., Kansas City Division (KCD). The KCD-designed bearing proved to be the best barrier, but the torque required to function the bearing was magnitudes above the commercial bearings. The commercial sealed bearing was an effective barrier, allowing a small fraction of particles to migrate through, and had a relatively low running torque. The shielded bearing was not acceptable as a particle barrier.

1862 (KCP–613-5215) **Shape memory metals: Final report.** Dworak, T.D. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001373. Source: OSTI; NTIS; GPO Dep.

The ability to define a manufacturing process to form, heat-treat, and join parts made of nickel-titanium and/or copper-zinc-aluminum shape memory alloys was investigated. The specific emphasis was to define a process that would produce shape memory alloy parts in the configuration of helical coils emulating the appearance of compression springs. In addition, the mechanical strength of the finished parts along with the development of a electrical lead attachment method using shape memory alloy wire was investigated.

1863 (KCP–613-5218) **Cleaning of optical components for high-power laser-based firing systems.** Sparrow, B.D.; Hendrix, J.L. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Aug 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94001169. Source: OSTI; NTIS; GPO Dep.

This report discusses the progress of AlliedSignal Inc., Kansas City Division (KCD), in addressing the issues of cleaning of hardware and optical components for laser-based firing sets. These issues are acceptability of cleaning processes and techniques of other government programs to the quality, reliability, performance, stockpile life, materials compatibility issues, and, perhaps most important, environmentally conscious manufacturing requirements of the Department of Energy (DOE). A review of "previous cleaning art" is presented using Military Standards (MIL STDs) and Military Interim Specifications (MISs) as well as empirical data compiled by the authors. Observations on processes and techniques used in building prototype hardware and plans for future work are presented.

1864 (LA-UR–90-1423) **Output measurements of the FMU-139 fuze.** Dallman, J.C. Los Alamos National Lab., NM (United States). 27 Mar 1990. 103p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002621. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Insensitive munitions generally contain explosives that are less sensitive to initiation stimuli and provide for a margin of safety in fires or from projectile attack. Fuze designs that are effective with a tritonal explosive may not reliably initiate less sensitive explosives. In addition, it has been proposed that the fuze booster be an insensitive explosive. This would be especially valuable in an all-up round. However, most insensitive formulations are less energetic than the more sensitive ones. The combination of less sensitive main charge fills and less energetic boosters will necessitate a reevaluation of the entire fuze design. Because redesign of the fuze-booster package will be necessary in insensitive munitions, a more fundamental understanding of the output of the current fuzes in the inventory was undertaken. A high speed framing camera was used to examine the three dimensional expansion of the fuze following detonation. In these pictures the fuze is seen to expand in a regular and fairly symmetric manner with no evidence of significant metal jetting. These photographs imply that the method of main charge initiation is a conventional shock-to-detonation. In a

series of aquarium tests an FMU-139 was detonated in a chamber filled with a high density zinc chloride-water solution. This solution provided both the shock wave trajectory tracing media and a reasonable shock-impendance mock-up of an organic explosive. Using a multiple axis photography technique, the shock velocity transmitted to the solution was measured at several locations simultaneously. The results of the aquarium tests are shown in the appendices of this report. The highest pressures measured in the zinc chloride, about 13.8 GPa, occur on the opposite side of the fuze from the detonator and near the end of the fuze. This is the location where initiation of the main charge in a Mk 80 series bomb is most likely to occur.

1865 (LA-UR–93-3103) **Supercritical fluid carbon dioxide cleaning of plutonium parts.** Hale, S.J.; Haschke, J.M.; Cox, L.E. Los Alamos National Lab., NM (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308150–2: Environmentally conscious manufacturing congress '93, Arlington, VA (United States), 30 Aug - 1 sep 1993). Order Number DE93040142. Source: OSTI; NTIS; INIS; GPO Dep.

Supercritical fluid (SCF) carbon dioxide (CO_2) is being evaluated for use as a cleaning solvent to replace 1,1,1-trichloroethane for the final cleaning of plutonium (Pu) parts. These parts must be free of organic residue to avoid corrosion in the stockpile. Thermodynamic and kinetic data for selected reactions of Pu metal are evaluated as a basis for assessing the risk of a violent exothermic reaction during the use of SCF CO_2 on Pu. The need for considering kinetic behavior of a reaction in assessing its thermal risk is demonstrated. Weight difference data and results of xray photoelectron spectroscopy to evaluate the surface after exposure to the supercritical fluid show that SCF CO_2 is an effective and compatible cleaning solvent.

1866 (ORNL/TM–12478) **Enhanced signal processing algorithms for buried unexploded ordnance detection and location estimation with magnetometer and electromagnetic induction measurements.** Witten, A. Oak Ridge National Lab., TN (United States). Sep 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001844. Source: OSTI; NTIS; GPO Dep.

Enhanced signal processing algorithms have been developed for the detection and location of buried unexploded ordnance using magnetometry and electromagnetic induction (EMI) measurements. These signal processing algorithms are related to those used to image with geophysical diffraction tomography (GDT) employing wave-based measurements. The underlying relationship of GDT is the Generalized Projection Slice Theorem (GPST) that relates the spatial Fourier transform of acquired data to the spatial Fourier transform of subsurface inhomogeneities of one higher dimension. This relationship can be used to simulate data templates for known targets and, by virtue of the shift property of Fourier transforms, a data simulation need only be computed for one reference target location. All other target locations are generated by an appropriate phase shift. These data templates can be correlated with acquired data to determine the spatial distribution of probable target location. This approach to target detection and location estimation, referred to as a maximum likelihood estimation, can be used to produce an "image" of the likelihood of a specified target's position. For non wave-based methods, the relationship between data and target characteristics is not strictly associated with Fourier transforms. In the case of magnetometry, the appropriate GPST requires a Fourier-Laplace transform of the target characteristics while the EMI GPST is based on an integral transform with a complex wavenumber. Nevertheless, the shift rule for integral transforms can be invoked to yield GPST's for these tools and the associated computationally efficient maximum likelihood estimators. The EMI detection algorithm was applied to data acquired at a known underground storage tank site and the algorithms for both magnetometry and EMI were applied to data acquired at the Magnetic Range of the Naval EOD Tech Center in Indian Head, Maryland.

1867 (SAND–93-2156) **Autocharacterization feasibility system on Hunters Trophy event.** Mills, R.A. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94002611. Source: OSTI; NTIS; GPO Dep.

An automated system to characterize cable systems at NTS has been developed to test the feasibility of such a system. A rack of electronic equipment including a fast pulse generator, digital sampling scope, coaxial switch matrix and GPIB controller was installed downhole at NTS for the Hunters Trophy event. It was used to test automated characterization. Recorded measurements of simulation and other instrument data were gathered to determine if a full scale automated system would be practical in full scale underground nuclear effects tests. The benefits of such a full scale system would be fewer personnel required downhole; more instrument control in the uphole recording room; faster acquisition of cable parameter data.

1868 (SAND–93-2199) **Topics in stockpile evaluation.** Mueller, F.W. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94001165. Source: OSTI; NTIS; GPO Dep.

This report is a compilation of previously unpublished papers pertinent to Stockpile Evaluation, Reliability, and Safety activities at Sandia.

1869 (SAND–93-8220) **Design and development of Dummy Center Bomb Subassemblies.** Williams, G.A. Sandia National Labs., Livermore, CA (United States). Oct 1993. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94002612. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The author has developed a B57 Dummy Center Bomb Subassembly (DCBS) for inclusion in the H1624 and H1625 Insert Kits for use with the H1501 and H1501A Transportation Accident Resistant Containers (TARCs) and a B61 DCBS for inclusion in the H1626 Insert Kits for use with the H1501B TARCs. The DCBS replaces the real Center Bomb Subassembly (CBS) to facilitate transportation of weapon nose and tail sections.

1870 (UCRL-ID–115135) **Test and analysis of canister-frame connections.** Lo, Ting-Yu; Davito, A.M. Lawrence Livermore National Lab., CA (United States). 31 Aug 1993. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001858. Source: OSTI; NTIS; GPO Dep.

A finite element analysis was performed for the structural connections of a downhole nuclear test emplacement assembly. The bolt loads as well as the stresses in the cable trays and end plates of the assembly were examined for a range of bolt preloads and applied external axial loads. The focus of this study was the effects of preload on the bolt load and the stresses in various parts of the assembly. The effects of bolt size and door strap were also examined. A full-scale pull test of the structural connections was performed. The results of the test validated not only the finite element analysis but also the computer code NIKE3D used in the analysis.

1871 (UCRL-JC–113621) **Determining a cost/effectiveness/safety tradeoff methodology for strategic nuclear warheads.** Erickson, S.A. Jr.; Hall, C.H. Lawrence Livermore National Lab., CA (United States). 27 Apr 1992. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9204148–6: 33. joint The Institute of Management Science/Operation Research Society of America (TIMS/ORSA) national meeting, Orlando, FL (United States), 29 Apr - 8 may 1992). Order Number DE93018633. Source: OSTI; NTIS; GPO Dep.

Department of Energy national laboratories are charged with anticipating with a long leadtime which technologies for nuclear warheads should be developed. The Safe Warhead System Study was constituted to provide Lawrence Livermore National Laboratory management with information and suggestions for making such decisions for enhanced safety warheads. The Minuteman III replacement warheads were analyzed as a test case and that information was used to identify and describe the dominant issues, to develop a methodology and to make initial recommendations. The test case work resulted in several insights into how ongoing design and engineering interacts with the technology ranking and

on how to cope with the ubiquitous uncertainties relating to our current ICBM force.

1872 (UCRL-JC–115270) **FlowSim/FlowRisk: A code system for studying risk associated with material process flows.** Kaufman, A.M. Lawrence Livermore National Lab., CA (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303221–3: Probabilistic safety assessment and management (PSAM) conference, San Diego, CA (United States), 20-24 Mar 1993). Order Number DE94001766. Source: OSTI; NTIS; GPO Dep.

The need to study and assess life-cycle risks of Pu release by nuclear warheads during peace time lead to the development of a code suite which could model day to day operations involving nuclear weapons and calculate the associated risk involved in these proceedings. The life-cycle study called LIONSHARE is described in Reference 1. The code that models the flow is called FlowSim. The code that evaluates the associated risk is called FlowRisk. We shall concentrate here on the methodology used by FlowSim in modeling material flows. FlowRisk, mainly a postprocessor of FlowSim runs, will be dealt with in less detail.

4503 Nuclear Explosion Detection

1873 (LA-UR–92-244) **Seismic reflection surveys before and after BEXAR at the Nevada Test Site: Los Alamos Source Region Project: Final report.** Miller, R. (Kansas Geological Survey, Lawrence, KS (United States)); Steeples, D. Los Alamos National Lab., NM (United States); Kansas Geological Survey, Lawrence, KS (United States). 7 Jan 1992. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040671. Source: OSTI; NTIS; INIS; GPO Dep.

It is believed that spall may have an important effect on various DOE systems designed for verification of -nuclear underground test treaties. The acoustic pulse studied by the Ionospheric Monitoring Program is created specifically by the rapid acceleration of the ground surface of the spall region. Simulation studies indicated that spall effects on surface and body waves may need to be included for proper regional discrimination and yield estimation (Taylor and Randall, 1989). Detailed experimental studies of spall have been sparse. Some work with small contained chemical explosions (Stump, 1985) have measured the spall mass and characteristics. There is a need to extend these measurements to full UGT strengths.

1874 (LA-UR–92-3393) **The effects of 450 kg surface explosions at the E layer of the Ionosphere: Los Alamos Source Region Project.** Fitzgerald, T.J.; Carlos, R.C. Los Alamos National Lab., NM (United States). 22 Oct 1992. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040817. Source: OSTI; NTIS; INIS; GPO Dep.

A network of hf ionospheric sounders consisting of two transmitter and two receiver stations was deployed to detect the effects of acoustic waves generated by surface ground motion following an underground nuclear test (UGT) at the Nevada Test Site. The frequency of the transmissions were chosen so that the hf radio waves were totally reflected in the E layer of the ionosphere at an altitude of approximately 100 km. The transmissions were highly stable cw tones at two frequencies separated by 100 kHz so that two altitudes separated by approximately .5 km could be sensed. The network sampled four geographic locations in the ionosphere ranging from almost directly overhead of the UGT out to a horizontal range of 60 km. The ionospheric sounders detected disturbances on all the paths beginning at approximately 325 s after the UGT which persisted for up to 100 s. These disturbances will be described in detail in a later paper. Shortly after the UGT an extended series of ionospheric disturbances were detected which we ascribe to the arrival of acoustic shock waves at the E layer caused by the surface detonation of ordinance with effective yields of 450 kg of high explosive during an unrelated exercise conducted by the U. S. Air Force at a nearby bombing range. The conjunction of these disturbances produced a direct comparison of the effects of UGT's and surface explosions in the ionosphere. In this paper we describe the effects produced by the surface explosions and interpret the disturbance in terms of diffraction induced by electron density changes accompanying the passage of the acoustic waves from the explosions through the reflection altitudes.

1875 (LA-UR–93-1884) **Sensitivity of the close-in seismic source function to rock properties: Los Alamos Source Region Program.** App, F.N. Los Alamos National Lab., NM (United States). May 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040508. Source: OSTI; NTIS; GPO Dep.

The objective of this investigation is to determine and evaluate how rock properties near the origin of an explosion influence the close-in seismic source function. This is work in progress that represents one step in the systematic investigation of parameters important in the remote identification of underground nuclear tests. In this study, the 'overshoot" and "steady state value" of the reduced displacement potential, and the "corner frequency" and "rolloff" of the reduced velocity potential spectrum are the properties of the source function used as principal measures of effect. A series of one-dimensional, spherically symmetric calculations are made with the computational mesh divided into six phenomenological regions. Material properties are modified in selected regions to evaluate source function sensitivities.

4505 Strategic Defense Initiative

1876 (CONF-930722–50) **Ion beam milling of silicon carbide optical components.** Hylton, K.W.; Carnal, C.L.; Jackson, J.R.; Egert, C.M. Oak Ridge National Lab., TN (United States). [1993]. 12p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Agreement 1855-1662-A1. From Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE); San Diego, CA (United States); 11-16 Jul 1993. Order Number DE94002439. Source: OSTI; NTIS; GPO Dep.

Silicon carbide (SiC) is emerging as an important ceramic material for optical applications requiring stiff, lightweight structures with good thermal conductivity. This report discusses the application of ion milling in the fabrication of SiC optical components. Ion beam milling combined with either ductile grinding or polishing provides an excellent approach to deterministic fabrication of SiC optical components. Results of recent roughness evolution studies for SiC samples prepared by several pre-ion milling fabrication processes suggest that ductile grinding and some polishing processes can be used to produce low-subsurface-damage components suitable for ion milling. Results are also presented of experiments in which these processes have been used in conjunction with ion milling to figure SiC optical components. Typical improvements with optical figures after ion milling have convergences on the order of 2 or 3. Overall, these experiments indicate that ion milling combined with other fabrication processes represents a viable, highly deterministic approach to producing high-precision SiC optical components.

1877 (LA–12168-MS) **Theater SBI cost-effectiveness ratios.** Canavan, G.H. Los Alamos National Lab., NM (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001573. Source: OSTI; NTIS; GPO Dep.

To address M missiles spaced at intervals longer than the constillation reconstitution time t, the defense needs at the absentee ratio N_a of SBIs to fill the belt plus the M SBIs needed for the intercepts; the resulting cost effectiveness scales as $M/(M + N_a)$. N_a is large and CER small for small ranges and numbers of missiles. For several-hundred missile threats, CERs are greater than unity for ranges of interest.

1878 (LA–12169-MS) **Scaling of interceptors for theater defense.** Canavan, G.H. Los Alamos National Lab., NM (United States). Nov 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001851. Source: OSTI; NTIS; GPO Dep.

For nominal GBI and SBI cost parameters GNIs are preferred for missile ranges under $\approx$ 1.000 km; for multiple theaters breakeven ranges decreases to $\approx$ 500 km. Penalties for using GBIs rather

than SBIs for long-range missiles are ≈ factor of 2; penalties for using SBIs for short-range missiles an be larger.

1879 (LA–12297-MS) **An entry-level conventional radar-driven rocket anti-satellite.** Canavan, G.H. Los Alamos National Lab., NM (United States). Nov 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001572. Source: OSTI; NTIS; GPO Dep.

Simple anti-satellites (ASATs) can be based on current, conventional technology available to most countries today. ASATs based on radar-guidance could release pellets in front of a satellite to destroy it or consume its maneuver fuel. The relationship between satellite mass and area is fixed, as is that with altitude. Sensor satellites should be large and high; non-sensor satellites should be small. The optimized radar powers and areas and ASAT masses are in the range of components now in commerce, which suggests that they could be developed and used soon.

1880 (LA–12300-MS) **High-velocity interceptors for boost-phase intercepts.** Canavan, G.H. Los Alamos National Lab., NM (United States). Nov 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001077. Source: OSTI; NTIS; GPO Dep.

Brilliant kill packages with existing booster technology, warning, and command and control could produce interceptors that could reduce the effectiveness of theater attacks in the boost phase.

1881 (UCRL-JC–112636) **A packet based, data driven telemetry system for autonomous experimental sub-orbital spacecraft.** Kalibjian, J.R. Lawrence Livermore National Lab., CA (United States). 26 Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310131–6: 29. annual international telemetering conference, Las Vegas, NV (United States), 25-28 Oct 1993). Order Number DE94000399. Source: OSTI; NTIS; GPO Dep.

A data driven telemetry system is described that responds to the rapid nature in which experimental satellite telemetry content is changed during the development process. It also meets the needs of a diverse experiment which the many phases of a mission may contain radically different types of telemetry data. The system emphasizes mechanisms for achieving high redundancy of critical data. A practical example of such an implementation, Brilliant Pebbles Flight Experiment Three (FE-3), is cited.

1882 (UCRL-JC–112637) **Automated application of calibration factors on telemetered data.** Kalibjian, J.R.; Voss, T.J.; Yio, J.J. Lawrence Livermore National Lab., CA (United States). 26 Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310131–5: 29. annual international telemetering conference, Las Vegas, NV (United States), 25-28 Oct 1993). Order Number DE94000402. Source: OSTI; NTIS; GPO Dep.

A long standing problem in telemetry post processing is the application of correct calibration factors to telemetered data generated on a system which has had a history of hardware changes. These calibration problems become most exacerbated when old test data is being examined and there is uncertainty as to hardware configuration at the time of the test. In this paper a mechanism for introducing a high degree of reliability in the application of calibration factors is described in an implementation done for Brilliant Pebbles Flight Experiment Three (FE-3).

1883 (UCRL-JC–112639) **Automated analysis tools for reducing spacecraft telemetry data.** Voss, T.J. Lawrence Livermore National Lab., CA (United States). 26 Apr 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310131–3: 29. annual international telemetering conference, Las Vegas, NV (United States), 25-28 Oct 1993). Order Number DE94000400. Source: OSTI; NTIS; GPO Dep.

A practical description is presented of the methods used to reduce spacecraft telemetry data using a hierarchial toolkit of software programs developed for a UNIX environment. A project requiring the design, implementation and test flight of small, lightweight spacecraft was recently conducted. This spacecraft development required hundreds of tests and integrations of subsystems on several special purpose testbeds, with each test creating large amounts of telemetered data. This paper focuses on the automated analysis and reduction of data which is telemetered from one of the key subsystems, the Probe. A typical telemetry stream from a testbed run averaged 50 Megabytes of raw data, containing over 1600 system variables. The large telemetry file (raw data) sent from the Probe was decoded and decomposed into a large number of smaller Break Out Files (BOFs) containing variables with timestamps, and image files.

1884 (UCRL-JC–113499) **Recent results from the Spacecraft Fabrication and Test MODIL.** Saito, T.T. Lawrence Livermore National Lab., CA (United States). Apr 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930493–2: 11. Society of Photo-Optical Instrumentation Engineering (SPIE) applications of artificial intelligence, Orlando, FL (United States), 12-16 Apr 1993). Order Number DE93040548. Source: OSTI; NTIS; GPO Dep.

The Spacecraft Fabrication and Test Manufacturing Operations Development and Integration Laboratory (SF&T MODIL) is working with SDIO program offices and contractors to reduce schedule and budget risks for SDIO systems as they go into production. The concurrent engineering thrust has identified potential high payoff areas. A materials and structures demonstration project has been successfully completed in partial automated closing of matched metal molds for a continuous fiber composite. In addition to excellent accuracy, the parts demonstrated excellent predictability and repeatability of physical properties. The cryocooler thrust successfully demonstrated and inserted precision technologies into a generic cryocooler part. The precision technologies thrust outlined two potentially high payoff areas in precision alignment and miniature rocket thrust measurement. The Producible Technology Working Group (PTWG) efforts identified the need for a test and assembly thrust. Due to funding limitations, continuing efforts are limited to the cryocooler thrust.

4506 Chemical and Biological

1885 (UCRL-ID–114107) **The decay of chemical weapons agents under environmental conditions.** McGuire, R.R.; Haas, J.S.; Eagle, R.J. Lawrence Livermore National Lab., CA (United States). 9 Apr 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93040440. Source: OSTI; NTIS; GPO Dep.

The rate and mechanism of decay of chemical agents in the environment was studied via live agent field trials at the chemical and Biological Defence Establishment, Porton Down, UK. The plan was to deposit the agents GD (Soman), VX, and H (sulfur mustard) on separate l-m^2 plots on three successive days; i.e., Tuesday through Thursday. The depositions were to be made so as to give an areal concentration of 10 g/m^2. Four felt pads of approximately 25 cm^2 each were placed at the corners of each of the test plots. These were subsequently extracted and analyzed by CBDE to determine the actual agent concentration. Samples for LLNL (two different types of soil, disks of silicone rubber gasket material, and short cylinders of concrete were to be contaminated and analyzed. Results are described.

54 ENVIRONMENTAL SCIENCES

Refer also to citation(s) 784, 844, 1819, 2802

1886 (BFR-T–4-93) **The environmental impact of new energy technology: Solar cells, absorption heat pumps, energy economy.** Tillman, A.M. (Chalmers Univ. of Technology, Gothenburg (Sweden). Technical Environment Planning); Svensson, Torbjoern. Swedish Council for Building Research, Stockholm (Sweden). 1993. 84p. (In Swedish). Order Number DE94709814. Source: OSTI; NTIS.

This report examines the environmental impact of solar cell technology, absorption heat pumps and passive energy economy in buildings. A systematic description is given of these technologies with reference to the environmental stresses they cause, the effects these have on the environment, and the evaluation of these effects. figs., tabs., 79 refs.

1887 (CNIC–00686) **Study on the subject system of environmental radiochemistry.** Qiang Yi zhong (Suzhou Medical Coll., JS (China)). China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 10p. (In Chinese). (SMC–0087.). Order Number DE94604280. Source: OSTI; NTIS (US Sales Only); INIS.

The environmental radiochemistry is a new frontier discipline. So, it is very important to study the system of this subject. A brief introduction of its development background and history are presented. The definition of the environmental radiochemistry has been studied. Main contents containing in the subject have been classified and reviewed in accordance with different modalities. Five major features of the environmental radiochemistry are suggested. Issues to be considered recently in the environmental radiochemistry are also discussed.

1888 (DOE/EH–0346) **Environment, Safety and Health progress assessment of the Idaho National Engineering Laboratory (INEL).** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Aug 1993. 268p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001713. Source: OSTI; NTIS; INIS; GPO Dep.

The ES&H Progress Assessments are part of the Department's continuous improvement process throughout DOE and its contractor organizations. The purpose of the INEL ES&H Progress Assessment is to provide the Department with concise independent information on the following: (1) change in culture and attitude related to ES&H activities; (2) progress and effectiveness of the ES&H corrective actions resulting from previous Tiger Team Assessments; (3) adequacy and effectiveness of the ES&H self-assessment programs of the DOE line organizations and the site management and operating contractor; and (4) effectiveness of DOE and contractor management structures, resources, and systems to effectively address ES&H problems. It is not intended that this Progress Assessment be a comprehensive compliance assessments of ES&H activities. The points of reference for assessing programs at the INEL were, for the most part, the 1991 INEL Tiger Team Assessment, the INEL Corrective Action Plan, and recent appraisals and self-assessments of INEL. Horizontal and vertical reviews of the following programmatic areas were conducted: Management: Corrective action program; self-assessment; oversight; directives, policies, and procedures; human resources management; and planning, budgeting, and resource allocation. Environment: Air quality management, surface water management, groundwater protection, and environmental radiation. Safety and Health: Construction safety, worker safety and OSHA, maintenance, packaging and transportation, site/facility safety review, and industrial hygiene.

1889 (LA-UR–93-3406) **Neighborhood Environmental Watch Network.** Sanders, L.D. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309146–5: 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management, Atlanta, GA (United States), 27-29 Sep 1993). Order Number DE94000819. Source: OSTI; NTIS; INIS; GPO Dep.

The Neighborhood Environmental Watch Network (NEWNET) is a regional network of environmental monitoring stations and a data archival center that supports collaboration between communities, industry, and government agencies to solve environmental problems. The stations provide local displays of measurements for the public and transmit measurements via satellite to a central site for archival and analysis. Station managers are selected from the local community and trained to support the stations. Archived data and analysis tools are available to researchers, educational institutions, industrial collaborators, and the public across the nation through a communications network. Los Alamos National Laboratory and the Environmental Protection Agency have developed a NEWNET pilot program for the Department of Energy. The pilot program supports monitoring stations in Nevada, Arizona, Utah, Wyoming, and California. Additional stations are being placed in Colorado and New Mexico. Pilot stations take radiological and meteorological measurements. Other measurements are possible by exchanging sensors.

1890 (WHC-SA–1939) **Method for evaluating cumulative impacts of projects which involve uncertainty in the baseline environmental conditions.** Eccleston, C.H. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–16: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001227. Source: OSTI; NTIS; INIS; GPO Dep.

Analysis of cumulative impacts is typically an inexact science. Evaluating cumulative impacts when there is uncertainty in project design data can further complicate the analysis of cumulative impacts. Additionally, a lengthy and expensive effort is often required to obtain baseline data necessary to conduct a quantitatively rigorous analysis of cumulative impacts. Such an extensive effort, would in many cases, only amount to quantifying what is intuitively obvious, adding little substantive value to the decision-making process. Analysts should therefore, carefully weigh the additional value that would be derived before a decision is made to initiate such a study. In many situations, less rigorous approaches may provide decision makers with reliable information that will support the decision-making process. The following discussion outlines such an approach. The approach involves determining the degree to which cumulative impacts would be changed as a result of pursuing an action. This approach combines a quantitative impact analysis of the proposed action with a qualitative analysis of the existing baseline environment. Such an approach is applicable to many different situations where there is uncertainty or incomplete information concerning baseline environmental conditions. The methodology can be applied to the analysis of cumulative impacts for a wide variety of activities that directly or indirectly support environmental remediation projects.

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 2, 3, 4, 5, 36, 40, 41, 42, 44, 46, 47, 48, 49, 60, 81, 158, 381, 382, 386, 389, 393, 468, 574, 669, 825, 832, 833, 841, 915, 946, 953, 975, 976, 1161, 1208, 1268, 1395, 1610, 1696, 1698, 1756, 1978, 2000, 2070, 2072, 2241, 2309, 2769

1891 (AAA-KTF/FKF–92/4) **Reactions of NO on char surfaces: Preliminary laboratory results.** Uusikartano, T. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 16p. Order Number DE94709689. Source: OSTI; NTIS.

LIEKKI Research Programme.

This report summarizes the results of the preliminary laboratory tests concerning the reactions of nitrogen oxide, NO, on char surfaces. The work is a part of studies to explore the details of the nitrogen chemistry in fluidized bed combustors. All experiments at 200 ppm NO show higher NO concentrations than what was led into the reactor. The results at 200 ppm NO are dealt with as implying a real behaviour of NO under different conditions only having a shift upward in all concentrations caused by an unknown factor. The same kind of behaviour (temperature dependency, non reversibility and response to different gaseous additives) as at 1000 ppm NO supports the conclusion that variations in NO concentrations in these measurements stem from the same phenomena as at 1000 ppm. The nonreversibility of NO reduction is somehow dependent on the phenomena taking place in the bed material. The weight of the bed material was reduced in average by 19 % in experiments without O_2 addition and by 60 % in experiments with O2, the latter indicating that coal in the bed has burned to some extent. There exists a correlation between measurements during the isothermal period at 900 deg C and the extent of non reversibility, more clearly seen at the input level of 1000 ppm NO. If the measurements at 900 deg C show almost the same NO reduction (figs 5 and 6 at NO level of 1000 ppm) then the non reversibility is essentially temperature independent exhibiting only non reversibility.

1892 (AAA-KTF/FKF–92/6) **A scanning electron microscope study of limestone and dolomite particles reacted with SO_2 or H_2S.** Yrjas, P. Aabo Akademi, Turku (Finland). Combustion Chemistry Research Group. 1992. 23p. Order Number DE94709691. Source: OSTI; NTIS.

LIEKKI Research Programme.

This report presents a scanning electron microscope study of both calcined and uncalcined limestone and dolomite particles. The particles have been reacted with different sulfur compounds that are formed under either pressurized combustion or pressurized gasification conditions. Both limestone and dolomite particles have been shown to absorb both SO_2 and H_2S. The degree of conversion varies significantly depending on whether the absorbents are calcined or not. The most effective absorbent under pressurized combustion conditions was shown to be uncalcined limestone, while for pressurized gasification the fully calcined dolomite and the calcined limestone seem to be the best alternatives. The unreacted shrinking core model seems to be valid for the sulfation of calcium carbonate and this was also confirmed. It was also shown that the model is not valid for the sulfation of calcined limestone particles. Furthermore, the earlier conclusion made by lisa et al. that the sulfidization of limestone and dolomite is limited by sample bed diffusion was supported. A table of the absorbents' sulfur capacities is summarized in appendix B. Finally, it can be said that scanning electron microscopy is a reliable and convenient method of examining limestone and dolomite particles. Good images can be obtained either by a printing program or by a special camera. Also, the possibility of making an elementary analysis was found to be valuable.

1893 (ANL/EAIS/CP–78684) **Coupling the dispersion of particulates to wind-dependent emission rates.** Faillace, E.R. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930810–7: Topical meeting on environmental transport and dosimetry, Charleston, SC (United States), 31 Aug - 3 sep 1993). Order Number DE93019020. Source: OSTI; NTIS; INIS; GPO Dep.

The emission of respirable particulates from area sources is directly proportional to the cube of the wind speed, and the dispersion of airborne particulates is directly proportional to the wind speed. The resulting downwind concentrations of wind-driven particulates are proportional to the square of the wind speed. A methodology is developed to scale the concentrations or doses calculated by regulatory models, which assume a constant emission rate, to account for the wind-dependent emission rate. Regulatory models tend to overestimate downwind concentrations in sectors where low wind speeds are most frequent, but they tend to underestimate concentrations in sectors where high wind speeds occur more frequently.

1894 (ANL/EAIS/CP–80792) **Is anyone regulating naturally occurring radioactive material? A state survey.** Gross, E.M.; Barisas, S.G. Argonne National Lab., IL (United States). Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–6: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94000462. Source: OSTI; NTIS; INIS; GPO Dep.

As far as we know, naturally occurring radioactive material (NORM) has surrounded humankind since the beginning of time. However, recent data demonstrating that certain activities concentrate NORM have increased concern regarding its proper handling and disposal and precipitated the development of new NORM-related regulations. The regulation of NORM affects the management of government facilities as well as a broad range of industrial processes. Recognizing that NORM regulation at the federal level is extremely limited, Argonne National Laboratory (ANL) conducted a 50-state survey to determine the extent to which states have assumed the responsibility for regulating NORM as well as the NORM standards that are currently being applied at the state level. Though the survey indicates that NORM regulation comprises a broad spectrum of controls from full licensing requirements to virtually no regulation at afl, a trend is emerging toward recognition of the need for increased regulation of potential NORM hazards, particularly in the absence of federal standards.

1895 (ANL/ER/CP–79760) **A description of the katabatic "plume" from Coal Creek Canyon and its fate in the Rocky Flats Area.** Coulter, R.L.; Shannon, J.D. Argonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930810–8: Topical meeting on environmental transport and dosimetry, Charleston, SC (United States), 31 Aug - 3 sep 1993). Order Number DE93019526. Source: OSTI; NTIS; INIS; GPO Dep.

Katabatic flow from Coal Creek Canyon often affects the region that includes the Rocky Flats Plant near Denver, Colorado. The flow from the canyon enters a wide, gently sloping plain approximately 5 km upwind of the plant. Measurements of this flow are combined with a theoretical analysis that describes the dimensions and strength of the flow across the plains as a function of downwind distance from Coal Creek.

1896 (ANL/ER/CP–79787) **Areally averaged estimates of surface heat flux from ARM field studies.** Coulter, R.L.; Martin, T.J.; Cook, D.R. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9303122–6: 3. ARM science team meeting, Norman, OK (United States), 1-5 Mar 1993). Order Number DE93018569. Source: OSTI; NTIS; INIS; GPO Dep.

The determination of areally averaged surface fluxes is a problem of fundamental interest to the Atmospheric Radiation Measurement (ARM) program. The Cloud And Radiation Testbed (CART) sites central to the ARM program will provide high-quality data for input to and verification of General Circulation Models (GCMs). The extension of several point measurements of surface fluxes within the heterogeneous CART sites to an accurate representation of the areally averaged surface fluxes is not straightforward. Two field studies designed to investigate these problems, implemented by ARM science team members, took place near Boardman, Oregon, during June of 1991 and 1992. The site was chosen to provide strong contrasts in surface moisture while minimizing the differences in topography. The region consists of a substantial dry steppe (desert) upwind of an extensive area of heavily irrigated farm land, 15 km in width and divided into 800-m-diameter circular fields in a close packed array, in which wheat, alfalfa, corn, or potatoes were grown. This region provides marked contrasts, not only on the scale of farm-desert (10–20 km) but also within the farm (0.1–1 km), because different crops transpire at different rates, and the pivoting irrigation arms provide an ever-changing pattern of heavy surface moisture throughout the farm area. This paper primarily discusses results from the 1992 field study.

1897 (ANL/ER/CP–80454) **Development of advanced cloud parameterizations to examine air quality, cloud properties, and cloud-radiation feedback in mesoscale models.** Lee, In Young. Argonne National Lab., IL (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310173–2: 5. international energy conference, Seoul (Korea, Republic of), 18-22 Oct 1993). Order Number DE93041164. Source: OSTI; NTIS; GPO Dep.

The distribution of atmospheric pollutants is governed by dynamic processes that create the general conditions for transport and mixing, by microphysical processes that control the evolution of aerosol and cloud particles, and by chemical processes that transform chemical species and form aerosols. Pollutants emitted into the air can undergo homogeneous gas reactions to create a suitable environment for the production by heterogeneous nucleation of embryos composed of a few molecules. The physicochemical properties of preexisting aerosols interact with newly produced embryos to evolve by heteromolecular diffusion and coagulation. Hygroscopic particles wig serve as effective cloud condensation nuclei (CCN), while hydrophobic particles will serve as effective ice-forming nuclei. Clouds form initially by condensation of water vapor on CCN and evolve in a vapor-liquid-solid system by deposition, sublimation, freezing, melting, coagulation, and breakup. Gases and aerosols that enter the clouds undergo aqueous chemical processes and may acidity hydrometer particles. Calculations for solar and longwave radiation fluxes depend on how the respective spectra are modified by absorbers such as H_2O, CO_2, O_3, CH_4, N_2O, chlorofluorocarbons, and aerosols. However, the flux calculations are more complicated for cloudy skies, because the cloud optical properties are not well defined. In this paper, key processes such as tropospheric chemistry, cloud microphysics parameterizations, and radiation schemes are reviewed in terms of physicochemical processes occurring, and recommendations are made for the development of advanced modules applicable to mesoscale models.

1898 (ANL/ER/CP–80457) **Overview of global greenhouse effects.** Reck, R.A. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310173–1: 5. international energy conference, Seoul (Korea, Republic of), 18-22 Oct 1993). Order Number DE93041165. Source: OSTI; NTIS; GPO Dep.

This report reviews the factors that influence the evolution of climate and climate change. Recent studies have confirmed that CO_2, O_3, N_2O, CH_4, and chlorofluorocarbos are increasing in abundance in the atmosphere and can alter the radiation balance by means of the so-called greenhouse effect. The greenhouse effect is as well-accepted phenomenon, but the prediction of its consequences is much less certain. Attempts to detect a human-caused temperature change are still inconclusive. This report presents a discussion of the scientific basis for the greenhouse effect, its relationship to the abundances of greenhouse gases, and the evidence confirming the increases in the abundances. The basis for climate modeling is presented together with an example of the model outputs from one of the most sophisticated modeling efforts. Uncertainties in the present understanding of climate are outlined.

1899 (BNL–49530) **Cloud-free aerosol optical depth determination over oceans from satellite radiometry.** Wagener, R. (Brookhaven National Lab., Upton, NY (United States)); Nemesure, S.; Benkovitz, C.M.; Schwartz, S.E.; Berkowitz, C.M.; Ghan, S.J. Brookhaven National Lab., Upton, NY (United States); Pacific Northwest Lab., Richland, WA (United States). Jun 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ;AC06-76RL01830. (CONF-940115–7: 74. American Meteorological Society annual meeting, Nashville, TN (United States), 23-28 Jan 1994). Order Number DE94001897. Source: OSTI; NTIS; GPO Dep.

Shortwave radiative forcing of climate by anthropogenic sulfate aerosol has been estimated to be of comparable global-average magnitude, but opposite sign, to longwave forcing by greenhouse gases (Charlson et al., 1992). It is therefore important that this forcing be accurately represented in climate models. Sulfate concentrations calculated by a Global Chemistry Model driven by operational meteorological data (GChM; Benkovitz et al., this meeting) exhibit high spatial and temporal variations that closely reproduce observations at continental sites. However, because of the sparsity of sulfate concentration measurements over oceans, aerosol optical depth determinations from satellite data are needed to evaluate the performance of the model over oceans. Previous studies of aerosol optical depths over oceans have employed Advanced Very High Resolution Radiometer Global Area Coverage (AVHRR GAC) data (Rao et al., 1989; Durkee et al., 1991) that should yield the required information, but the emphasis in these studies has been to produce wide spatial coverage by time averaging for periods of a week to a month, thereby masking the high spatial and temporal variability associated with the data and required for model evaluation. The Rao et al. method is employed in the production of the weekly composite aerosol maps by NOAA since June 1987. The authors report results obtained with a modified Durkee algorithm that provides instantaneous optical depths averaged over individual GChM model grid cells (1.125° x 1.125°) for comparison with optical depths predicted by the chemistry model at the same times and places (Berkowitz et al., this meeting). The optical depth retrieval is improved by a more accurate removal of sun-glint contamination, using the formulation of (Cox and Munk, 1956) for sun-glint probability as a function of wind speed, together with the wind speeds available from the operational meteorological data used to drive the chemistry model.

1900 (CEA-CONF–11501) **Presentation and interpretation of field experiments of gaseous UF6 releases in the atmosphere.** Crabol, B. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations); Boulaud, D.; Deville-Cavelin, G.; Geisse, C.; Iacona, L. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604330. Source: OSTI; NTIS (US Sales Only); INIS.

An experimental programme concerning the behaviour of UF_6 released in gaseous phase in the atmosphere has been conducted in the years 1986-1989 by the french Atomic Energy Commission and Eurodif. Three field tests have been performed on the CEA/CESTA experimental site. These experiments permitted to get informations about the kinetics of the hydrolysis reaction of the UF_6, the behaviour of the hydrolysis products in the atmosphere and the granulometry of the solid particles.

1901 (CEA-CONF–11514) **Field measurements of the washout coefficient for gaseous iodine likely to be released on accidental conditions.** Caput, C.; Camus, H.; Gauthier, D.; Belot, Y. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (In French). (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604331. Source: OSTI; NTIS (US Sales Only); INIS.

Field experiments were performed in Brittany to assess the washout coefficient Λ for molecular iodine. During each run, a few grams of nonradioactive iodine were released from a 12 meters telescopic mast, and the rain was sampled at a short distance downwind along complete transversal sections of the plume. The amount of iodine in each sample was determined by ionic chromatography to calculate the washout coefficient. In most cases, the results obtained (a few 10^{-5} s^{-1}) are not so different as expected from the theoretical values assuming a complete solubility of iodine in rain water. 4 refs., 1 fig., 1 tab.

1902 (CEA-CONF–11519) **Submicron-sized aerosol and radon progeny measurements in an uranium mine.** Boulaud, D.; Chouard, J.C. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (In French). (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604332. Source: OSTI; NTIS (US Sales Only); INIS.

Submicron-sized aerosol was studied in an uranium mine using an Electrical Aerosol Analyzer and a Differential Mobility Particle Sizer. In addition radon progeny particle size distributions were measured using a prototype instrument developed by us (SDI 2000). With cascade impactor the number weighted mean electrical mobility diameters and the geometric standard deviations ranged respectively from 0.05 to 0.1 μm and 1.8 to 2. The gross alpha activity weighted mean thermodynamic diameters ranged typically from 0.1 to 0.2 μm. 6 refs., 3 figs.

1903 (CONF-930796–5) **Environmental protection using social costing.** Lee, R. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1993 Chinese American Academic and Professional convention; Chicago, IL (United States); 2-5 Jul 1993. Order Number DE94000492. Source: OSTI; NTIS; INIS; GPO Dep.

Emissions and other residual wastes come from industrial production, commercial and household activities, and transportation. These wastes damage the environment, including human health. As economies grow, so does concern about balancing that growth with the desire for environmental protection. At issue is how much environmental protection we should have. We address this issue using the concept of social costing. The issue is discussed in the context of electric power generation. There is particular concern about the use of fossil fuels such as petroleum, the major fuel used in the Republic of China, and coal which is the most common fuel used in the U. S. Electric power generation is a major source of airborne pollutants such as SO_2, NO_x particulate matter, volatile organic compounds, CO, and CO_2. It also results in liquid and solid wastes, and other effects such as changes in land use. To generate electric power, fuel (such as petroleum, coal or enriched uranium) or some other resource (e.g., wind or geothermal) is needed. A fuel cycle consists of a sequence of activities and processes involved in generating electric power. These activities include fuel extraction, treatment and processing; fuel conversion into electricity; transmission; waste disposal; and transportation of

fuel and wastes between the different stages of the fuel cycle. Each stage results in emissions or other residuals. Several recent studies have been about the environmental costs of electricity.

1904 (DOE/ER/61029–15) **Measurement of HO_x· production rate due to radon decay in air.** Ding, Huiling. Clarkson Univ., Potsdam, NY (United States). Dept. of Chemistry. Aug 1993. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61029. Order Number DE94000878. Source: OSTI; NTIS; INIS; GPO Dep.

Radon in indoor air may cause the exposure of the public to excessive radioactivity. Radiolysis of water vapor in indoor air due to radon decay could produce (·OH and HO_2 ·) that may convert atmospheric constituents to compounds of lower vapor pressure. These lower vapor pressure compounds might then nucleate to form new particles in the indoor atmosphere. Chemical amplification was used to determine HO_x· production rate in indoor air caused by radon decay. Average HO_x· production rate was found to be $(4.31\pm0.07) \times 10^5$ HO_x· per Rn decay per second (Bq) 3.4 to 55.0% at 22C. This work provided $G_{(HO_x\cdot)}$-value, 7.86±0.13 No./100 eV in air by directly measuring [HO_x·] formed from the radiolysis procedure. This G value implies that HO_x· produced by radon decay in air might be formed by multiple processes and may be result of positive ion-molecule reactions, primary radiolysis, and radical reactions. There is no obvious relation between HO_x· production rate and relative humidity. A laser-induced fluorescence (LIF) system has been used for ·OH production rate measurement; it consists of an excimer laser, a dye laser, a frequency doubler, a gaseous fluorescence chamber, and other optical and electronic parts. This system needs to be improved to eliminate the interferences of light scattering and artificial ·OH produced from the photolysis of O_3/H_2O.

1905 (DOE/MC/28016–93/C0222) **Trace element emissions.** Benson, S.A.; Erickson, T.A.; Steadman, E.N.; Zygarlicke, C.J.; Hauserman, W.B.; Hassett, D.J. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC28016. (CONF-9306148–31: Coal-fired power systems '93: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 28-30 Jun 1993). Order Number DE93019894. Source: OSTI; NTIS; GPO Dep.

The predicting of inorganic transformations (major and minor components) during coal combustion has long been the focus of many research programs (Zygarlicke et al., 1992; Wilemski et al., 1992; Baxter, 1992). In the program described in this paper, the predictive techniques that have been applied to combustion are being modified to predict inorganic transformations under gasification conditions. Many of the current trace element predictive techniques are based on the assumption of equilibrium conditions and not on actual kinetically constrained transformations that occur during coal utilization. The approach used in this program is to combine inorganic transformation algorithms and the thermochemical equilibrium calculations (Ramanathan et al., 1989, 1991). These techniques will be developed to predict the particle-size and composition distribution of the resulting coal ash particulate, along with the state of the vapor species at selected conditions for major, minor, and trace constituents. Many of the computer models recently to predict the evolution of major developed and minor elements during coal gasification were made possible by the development on a highly quantitative analytical technique for coal analysis, CCSEM (Steadman et al., 1990). CCSEM provides a particle-size and composition distribution for the mineral contents of a particular coal for twelve major and minor elements. These raw CCSEM data are the primary input to the newest computer models of ash formation.

1906 (ENEA-RT-AMB–92-07) **Urban area suspended particulates: Characterization, sampling techniques and instruments.** De Zaiacomo, T. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute). Mar 1993. 36p. (In Italian). (RT/AMB–92-07). Order Number DE94716516. Source: OSTI; NTIS (US Sales Only).

Some tests performed with the aim of evaluating the amount of atmospheric particulates, collected by means of two different experimental arrangements, are presented. A commercial portable direct reading instrument of the optical type, useful for a real-time determination of aero-suspended particulate mass, was also tested and compared with another optical type instrument in evaluating the mass amounts and concentration levels of three different types of aerosols. A sampling unit is proposed that, by means of the possibility of simultaneously operating various instruments, allows more representative sampling of the aero-dispersed pollutants in urban areas.

1907 (EPA–600/R-93/141) **Offsite environmental monitoring report: Radiation monitoring around United States nuclear test areas, calendar year 1991.** Chaloud, D.J.; Dicey, B.B.; Mullen, A.A.; Neale, A.C.; Sparks, A.R.; Fontana, C.A.; Carroll, L.D.; Phillips, W.G.; Smith, D.D.; Thome, D.J. Environmental Protection Agency, Las Vegas, NV (United States). Environmental Monitoring Systems Lab. Jan 1992. 232p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-86NV10522. Order Number DE94002296. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the Offsite Radiation Safety Program conducted during 1991 by the Environmental Protection Agency's (EPA's) Environmental Monitoring Systems Laboratory-Las Vegas. This laboratory operates an environmental radiation monitoring program in the region surrounding the Nevada Test Site (NTS) and at former test sites in Alaska, Colorado, Mississippi, Nevada, and New Mexico. The surveillance program is designed to measure levels and trends of radioactivity, if present, in the environment surrounding testing areas to ascertain whether current radiation levels and associated doses to the general public are in compliance with existing radiation protection standards. The surveillance program additionally has the responsibility to take action to protect the health and well being of the public in the event of any accidental release of radioactive contaminants. Offsite levels of radiation and radioactivity are assessed by sampling milk, water, and air; by deploying thermoluminescent dosimeters (TLDs) and using pressurized ion chambers (PICs); and by biological monitoring of animals, food crops, and humans. Personnel with mobile monitoring equipment are placed in areas downwind from the test site prior to each nuclear weapons test to implement protective actions, provide immediate radiation monitoring, and obtain environmental samples rapidly after any occurrence of radioactivity release. Comparison of the measurements and sample analysis results with background levels and with appropriate standards and regulations indicated that there was no radioactivity detected offsite by the various EPA monitoring networks and no exposure above natural background to the population living in the vicinity of the NTS that could be attributed to current NTS activities. Annual and long-term trends were evaluated in the Noble Gas, Tritium, Milk Surveillance, Biomonitoring, TLD, PIC networks, and the Long-Term Hydrological Monitoring Program.

1908 (ES/ESH–36) **Paducah Gaseous Diffusion Plant environmental report for 1992.** Horak, C.M. (ed.) (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Paducah Gaseous Diffusion Plant, KY (United States). Sep 1993. 353p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001 ;AC05-84OR21400. Order Number DE94001937. Source: OSTI; NTIS; INIS; GPO Dep.

This two-part report, Paducah Gaseous Diffusion Plant Environmental Report for 1992, is published annually. It reflects the results of an environmental monitoring program designed to quantify potential increases in the concentration of contaminants and potential doses to the resident human population. The Paducah Gaseous Diffusion Plant (PGDP) overall goal for environmental management is to protect the environment and PGDP's neighbors and to maintain full compliance with all current regulations. The current environmental strategy is to identify any deficiencies and to develop a system to resolve them. The long-range goal of environmental management is to minimize the source of pollutants, reduce the generation of waste, and minimize hazardous waste by substitution of materials.

1909 (ES/ESH–37) **Portsmouth Gaseous Diffusion Plant environmental report for 1992.** Horak, C.M. (ed.) (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Portsmouth Gaseous Diffusion Plant, OH (United States). Sep 1993. 285p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC05-84OR21400 ;AC05-76OR00001. (POEF–3030). Order Number DE94001936. Source: OSTI; NTIS; INIS; GPO Dep.

This calendar year (CY) 1992 annual report on environmental surveillance of the US Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant (PORTS) and its environs consists of two parts: narrative, summaries, and conclusions (Part 1) and data presentation (Part 2). The objectives of this report are to: (1) report 1992 monitoring data for the installation and its environs that may have been affected by operations on the plant site, (2) provide reasonably detailed information about the plant site and plant operations, (3) provide detailed information on input and assumptions used in all calculations, (4) provide trend analyses (where appropriate) to indicate increases and decreases in environmental impact, and (5) provide general information on plant quality assurance.

1910 (ETDE/JP-mf–94714702) **Observational study of air pollution transport over a large urban complex.** Yoshikado, H. (National Institute for Resources and Environment, Tsukuba (Japan)); Mizuno, T.; Kondo, H.; Kitabayashi, K.; Shimokata, S.; Yamamoto, S. National Inst. for Resources and Environment, Tsukuba (Japan). 25 May 1993. 136p. (In Japanese). Order Number DE94714702. Source: OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan.

An observational investigation was made on the three-dimensional local meteological structure of air pollution from the urban and industrial areas in the coastal zone, using the middle southern district in the Kanto Plains as a model area. On the basis of the regional observation data during 1986-1991, the developmental process of sea breeze in the Tokyo metropolitan area in summer and the effects of the urban conditions on it were analyzed Further, analyses were made on the observation results of local front frequently recognized in the southern portion of Kanto area in early winter and high-level pollution in the stagnant region of weak wind. Its results clarified a three-dimensional structure of sea breeze and the effects of urban areas. For example, in summer morning, the ground-level air temperature in the center of Tokyo is higher by 2-3°C than suburban area. This fact is attributed to the lowering of the atmospheric pressure in the urbanized area which is combinedly affected by the nocturnal heat island and air temperature distribution in the upper air layer accompanying the local wind system. There is a mechanism that frequent high-level pollution caused by the barrier of the westward mountaneous region of Kanto area occurs in early winter. Such facts were able to be depicted concretely and three-dimensionally. 73 refs., 102 figs., 13 tabs.

1911 (EUR–14003) **Activity of 'JRC EMEP' station 1990 annual report.** Leyendecker, W. (Commission of the European Communities, Ispra (Italy). Joint Research Centre); Brun, C.; Geiss-Horsch, H.; Serrini-Lanza, G. Commission of the European Communities, Luxembourg (Luxembourg). 1992. 47p. Source: OSTI; NTIS (US Sales Only).

This report gives a general overview of air pollution monitoring at the EMEP station of the J.R.C. Ispra for the year 1990. SO_2, NO_2, O_3 and CO have been monitored routinely in air, SO_4, NO_3, NH_4, Cl, SPM, acidity and heavy metals in atmospheric particulate material and SO_4, NO_3, NH_4, Cl, Na, K, Ca, Mg, pH, electrical conductivity and acidity in atmospheric precipitation. Data for the meteorological parameters, wind direction, wind speed, temperature, relative humidity atmospheric pressure, precipitation and solar irradiation have been continuously collected. All data, forming a part of the required EMEP programme, have been transmitted to the EMEP data evaluation laboratory of the Chemical Co-ordinating Centre at the Norwegian Institute for Air Research (NILU), where they are used together with the data from all the participating countries of the EMEP programme to provide the background information necessary for the modelling of pollutant fluxes in Europe in the 'Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe'. (author). 9 refs., 11 figs., 32 tabs.

1912 (INIS-BR–3148, pp. 573-576) **Development of measure methods of radon in indoor air.** Yaginuma, L.T. (Sao Paulo Univ., Ribeirao Preto, SP (Brazil). Faculdade de Filosofia, Ciencias e Letras); Pela, C.A.; Navas, E.A.; Ghilardi, A.J.P. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The development of some conventional measuring methods, aiming obtain an estimation of radon concentration in air, mainly in indoor air is described, including the charcoal absorption collector, Lucas cell and thermoluminescent dosemeters. (C.G.C).

1913 (INIS-mf–13731, pp. 61) **Fast and multi-functional method of radon measurement.** Tian Zhiheng (Hengyang Inst of Technology, Hunan (China)); Xiao Detao; Zo Fuqi; Zhao Xiuliang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/measuring methods; ELECTRIC FIELDS; POLONIUM 218; RADIATION MONITORING; RADON; SENSITIVITY

1914 (INIS-mf–13731, pp. 90) **Investigation on distribution of indoor and outdoor radon concentrations.** Zhang Zhengguo (Hunan Central Environmental Monitoring Station (China)); Zhang liang; Li Chunxiu. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOUSES/radon; RADON/spatial distribution; ACTIVITY LEVELS; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; HEIGHT; HOUSES; RADON

1915 (INIS-mf–13731, pp. 95) **Indoor and outdoor concentration in China by SSNTD.** Tian Deyuan (Lab. of Industrial Hygiene, Ministry of Public Health, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHINA/radon; ACTIVITY LEVELS; CHINA; RADON; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; EXPERIMENTAL DATA; RADIATION MONITORING

1916 (INIS-mf–13731, pp. 96) **Radon-222 indoor concentration in the CIAE region of Beijing.** Zhang Huaiqin (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Chen Ling. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOUSES/radon 222; CHINA; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; EXPERIMENTAL DATA; HOUSES

1917 (INIS-mf–13731, pp. 125) **The measurement of equilibrium factor for radon by SSNTD.** Chen Ling (China Inst. of Atomic Energy, Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/radon; RADON/equilibrium; AEROSOLS; CALIBRATION; DENSITY; RADON; HUMIDITY; PARTICLE TRACKS; EQUILIBRIUM

1918 (INIS-mf–13731, pp. 126) **Measurement of radon accumulated concentrations in air by turbidimentric technique.** Wang Huanqiang (Hubei Province Inst. of Radiation Protection, Wuhan (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AIR/radon; AIR; RADON; BUILDUP; CONCENTRATION RATIO; COUNTING TECHNIQUES; DIELECTRIC TRACK DETECTORS; TURBIDITY

1919 (INIS-mf–13731, pp. 128) **Indoor radon measurement in the northern region of Bangladesh.** Islam, G.S. (Dept. of Physics, Rajshahi Univ., Rajshahi (Bangladesh)); Islam, M.A.; Haque, A.K.M.F.; Mistry, G.C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOUSES/bangladesh; RADON/activity levels; DIELECTRIC TRACK DETECTORS; EXPERIMENTAL DATA; HOUSES; BANGLADESH; RADON

1920 (INIS-mf–13731, pp. 129) **Assessment of radon concentration in Egyptian dwellings by using a passive technique.** Hassib, G.M. (The National Centre for Nuclear Safety and Radiation Control, Atomic Energy Authority (Egypt)); Hussein, M.I.; Amer, H.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EGYPTIAN ARAB REPUBLIC/radon; CONCENTRATION RATIO; DOSEMETERS; RADON; EXPERIMENTAL DATA; HOUSES; SMOKES

1921 (INIS-mf–13731, pp. 132) **Measurements of Rn-222 concentrations in dwellings in a city with high population.** Yaprak, G. (Ege Univ., Inst. of Nuclear Sciences (Turkey)); Kinaci, S.R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URBAN AREAS/radon 222; CONCENTRATION RATIO; DAUGHTER PRODUCTS; DIELECTRIC TRACK DETECTORS; HOUSES; URBAN POPULATIONS

1922 (INIS-mf–13731, pp. 133) **SSNTD is used to measure the radon concentration in the air in the air-conditioned building.** Lu Yangqiao (Lab. of Industrial Hygiene, Ministry of Public Health, Beijing (China)); Feng Yushui. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/buildings; AIR; AIR CONDITIONING; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; EXPERIMENTAL DATA; LABORATORIES; RADON; BUILDINGS

1923 (INIS-mf–13731, pp. 134) **Measurement of indoor radon concentration by CR-39.** Zhao Yuhua (China Inst. of Atomic Energy, Beijing (China)); Zhao Chongde; Hao Xiuhong; Zhou Peide; Guo Shilun. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/dielectric track detectors; RADON/nuclear facilities; BACKGROUND RADIATION; BUILDINGS; CONCENTRATION RATIO; DAUGHTER PRODUCTS; RADON

1924 (INIS-mf–13731, pp. 135) **Concentration of radon in the senery place in Chengde.** Zhou Lianjiang (Hebei Inst. of Radiation Hygiene (China)); Sun Kexin; Zhou Kaijian. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHINA/radon; ACTIVITY LEVELS; CHINA; RADON; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; EXPERIMENTAL DATA; RADIATION DOSES

1925 (INIS-mf–13731, pp. 173) **Development of measuring techniques using silicon diode pin detector for continuous radon monitoring.** Devillard, C. (Lab. de Microanalyses Nucleaires, UFR des Sciences et Techniques, La Bouloie, Univ. de Franche Comte, Besancon (France)); Chambaudet, A.; Barillon, R.; Klein, D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/radiation monitoring; COMPARATIVE EVALUATIONS; PERFORMANCE; RADON; SEMICONDUCTOR DETECTORS; SILICON DIODES

1926 (INIS-mf–13731, pp. 180) **Comparison of short-term radon monitoring to long-term averages.** Azimi-Garakani, D. (Radiation Hygiene Division, Paul Scherrer Inst. (Switzerland)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIATION MONITORING/comparative evaluations; RADON/radiation monitoring; CELLULOSE; DIELECTRIC TRACK DETECTORS; NITRATES; RADON; RELIABILITY

1927 (INIS-mf–13731, pp. 184) **Exhalation of ^{222}Rn from papers.** Ramola, R.C. (Division of Biophysics, Univ. of Salzburg, Salzburg (Austria)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON 222/paper; CONCENTRATION RATIO; HOUSES; IONIZATION CHAMBERS; PAPER; SURFACE BARRIER DETECTORS

1928 (INIS-mf–13731, pp. 186) **Radon measurement in dwelling around the hot spring in the north west of Iran.** Karamdoust, N.A. (Faculty of Education, Univ. of Tehran, Tehran (Iran, Islamic Republic of)); Afarideh, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/houses; RADON/thermal springs; BUILDINGS; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; DOSEMETERS; IRAN; RADON; HOUSES

1929 (INIS-mf–13731, pp. 337) **Radon concentration levels in dwelling and mine atmosphere in Mexico.** Segovia, N. (ININ, Mexico, D.F. (Mexico)); Pena, P.; Mireles, F.; Davila, I.; Quirino, L. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on

nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MEXICO/radon; ACTIVITY LEVELS; AIR; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; GEOLOGY; HOUSES; METEOROLOGY; MEXICO; RADON; MINES

1930 (INIS-mf–13731, pp. 338) **Radon measurements in some houses of Tsukuba science city-Japan.** Matiullah (Centre for Nuclear Studies, Islamabad (Pakistan)); Kudo, K.; Yang, X. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. JAPAN/radon; ACTIVITY LEVELS; CONCENTRATION RATIO; DAUGHTER PRODUCTS; DIELECTRIC TRACK DETECTORS; HOUSES; JAPAN; RADON

1931 (INIS-mf–13731, pp. 339) **Recent studies on radon–a measure of living standard.** Matiullah (Center for Nuclear Studies, Islamabad (Pakistan)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOUSES/radon; CALIBRATION STANDARDS; CONCENTRATION RATIO; DAUGHTER PRODUCTS; HOUSES; RADON; TEMPERATURE DEPENDENCE

1932 (INIS-mf–13731, pp. 344) **Radon level measurements inside mexican caves.** Borau, J. (Facultad de Ciencias, UNAM., Circuito Exterior, Mexico, D.F. (Mexico)); Gonzalez, A.; Espinosa, G.; Golzarri, J.I. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/caves; DIELECTRIC TRACK DETECTORS; MEXICO; RADON; CAVES

1933 (INIS-mf–13731, pp. 350) **Passive radon survey in three floor laboratory.** Abu-Jarad, F. (Energy Research Lab./Research Inst., King Fahd Univ. of Petroleum and Minerals, Dhahran (Saudi Arabia)); Islam, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/laboratories; BACKGROUND RADIATION; CALIBRATION; COMPARATIVE EVALUATIONS; DOSEMETERS; RADON; LABORATORIES

1934 (INIS-mf–13731, pp. 356) **Radon measurement in dwellings.** Birkholz, W. (Technische Hochschule Leipzig (Germany)); Klink, Th.; Baumbach, H.; Stiller, D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/houses; ACTIVITY LEVELS; COMPARATIVE EVALUATIONS; DAUGHTER PRODUCTS; RADON; HOUSES

1935 (INIS-mf–13731, pp. 360) **Measurements of radon levels using CSR detector in Harbin and Yan'an.** Shi Jinhua (Environmental Protection Bureau, Wuhan (China)); Chen Changhua. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/china; BALLOONS; COMPARATIVE EVALUATIONS; EXPERIMENTAL DATA; RADON; CHINA

1936 (INIS-mf–13731, pp. 364) **The effect of using water in a toilet on indoor radon level.** Zhai Pengji (Inst. of High Energy Physics, Academia Sinica, Beijing (China)); Zhao Yunlong. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON 222/activity levels; RADON 222/buildings; DIELECTRIC TRACK DETECTORS; DOSEMETERS; BUILDINGS; SPATIAL DISTRIBUTION; WATER

1937 (INIS-mf–13731, pp. 365) **Comparison of radon measuring instruments of Chinese make with of Japanese make in Xi'an.** Fan Xin (Shaanxi Provincial Antiepidemic Station, Xi'an (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/comparative evaluations; RADON/measuring instruments; CHINA; CONCENTRATION RATIO; JAPAN; RADON

1938 (INIS-mf–13731, pp. 368) **The application of CR-39 solid state nuclear track detectors to radon survey in the main cities of Inner Mongolia.** Shen Baoming (Inner Mongolia Inst. of Radiological Health and Protection, Huhhot (China)); Chen Ruihua; Wang Qingzhi. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/china; RADON/dielectric track detectors; ACTIVITY LEVELS; BUILDINGS; EXPERIMENTAL DATA; RADON; CHINA; URBAN AREAS; USES

1939 (INIS-mf–13731, pp. 369) **Indoor radon measured with nuclear track detectors and charcoal canisters in Hong Kong.** Luo Daling (Zhongshan Univ., Guangzhou (China)); Zhang Chunxiang; Young, E.C.M.; Yu, K.N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHARCOAL/activation detectors; RADON/activation detectors; RADON/dielectric track detectors; ACTIVITY LEVELS; BUILDINGS; CHARCOAL; EXPERIMENTAL DATA; HONG KONG; RADON

1940 (IVL-B–1105) **Chemical modelling of an aeroplane exhaust plume in the free troposphere.** Pleijel, K.; Moldanova, J.; Andersson-Skoeld, Y. Swedish Environmental Research Inst., Goeteborg (Sweden). Jun 1993. 76p. Order Number DE94709804. Source: OSTI; NTIS.

The following pilot study has simulated the chemical reactions occurring in an aeroplane exhaust plume using a photochemical atmospheric model. The investigated cases covered altitudes from 4 up to 10 km, i.e. the free troposphere, over a region in France. The simulated aeroplane exhaust included nitrogen oxides, carbon monoxide, and 11 different hydrocarbon compounds. The formation of chiefly ozone, nitric acid and organic nitrates were examined using a sensitivity analysis with respect to: the time of the emission release; different exhaust compositions corresponding to the various stages in air flight; convection causing plume dispersion; temperature; sunlight conditions; and background concentration

levels. In addition, four different cases were modelled at altitudes of 4, 6, 8 and 10 km with all the factors which influenced the concentrations included. The results from the simulations show that virtually all of the above parameters have a large effect on the formation of ozone, nitric acid and organic nitrates within the exhaust plume. In most cases, the ozone level initially decreased in the plume and then increased up to 1 ppb. At the highest altitude (10 km) studied, only a decrease in the ozone concentration was observed. Nitric acid levels increased in the plume at all altitudes with a maximum addition of 0.4 ppb. The organic nitrates studied follow more complicated reaction paths. At the start of the plume development, the concentrations of the organic nitrates increased for an altitude of 4 km but decreased at all of the other simulated heights. For the higher altitudes, an increase in concentration reaching 50 ppt occurred at a later stage in the plume development. 24 refs, 27 figs, 8 tabs.

1941 (JAERI-M–93-118) **Results and analysis of meteorological observation at Shimokita area.** Yamazawa, Hiromi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nagai, Haruyasu. Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 104p. (In Japanese). Order Number DE94718956. Source: OSTI; NTIS; INIS.

Meteorological observations and data collection from meteorological observatories were conducted in February, August and September, 1992 with the purpose of acquiring verification data for an atmospheric dispersion model. Observations were designed so as to acquire meteorological data over complex terrain under various meteorological conditions, such as snow covered ground surface in winter and land-sea breeze in summer. From the whole data ten periods of 24 to 48 hours which are suitable for model validation were selected. These periods cover wide variety of meteorological conditions from thermally induced circulations under a weak general wind condition to rather uniform and constant wind under a strong general wind condition. In the latter both strong westerlies of monsoon and easterlies of Yamase were observed. Vertical wind component was observed at a short interval in sodar observations. Mean values, standard deviations and spectra of vertical wind were analyzed to evaluate the reliability of sodar observation. The mean vertical winds reflect the terrain characteristics. It was concluded from the analysis of spectra that the standard deviation can be estimated by a simple arithmetic calculations of raw data. The dependency of the standard deviation on topography and stability was found to be qualitatively reasonable. Thus it was concluded that the mean value and the standard deviation of vertical wind from sodar can be used as a reference data of model verification. Although, more detailed analysis is essential in quantitative argument based on the spectral shape. (author).

1942 (LA–12586-PR) **Radioactive air emissions 1992 summary: Progress report.** Wahl, L. (comp.). Los Alamos National Lab., NM (United States). Oct 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94000542. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes, by radionuclide or product and by emitting facility, the Laboratory's 1992 radioactive air emissions. In 1992, the total activity of radionuclides emitted into the air from Laboratory stacks was approximately 73,500 Ci. This was an increase over the activity of the total 1991 radioactive air emissions, which was approximately 62,400 Ci. Total 1992 Laboratory emissions of each radionuclide or product are summarized by tables and graphs in the first section of this report. Compared to 1991 radioactive air emissions, total tritium activity was decreased, total plutonium activity was decreased, total uranium activity was decreased, total mixed fission product activity was increased, total ^{41}Ar activity was decreased, total gaseous/mixed activation product (except ^{41}Ar) activity was increased, total particulate/vapor activation product activity was increased, and total ^{32}P activity was decreased. Radioactive emissions from specific facilities are detailed in this report. Each section provides 1992 data on a single radionuclide or product and is further divided by emitting facility. For each facility from which a particular radionuclide or product was emitted, a bar chart displays the air emissions of each radionuclide or product from each facility over the 12 reporting periods of 1992, a line chart shows the trend in total emissions of that radionuclide or product from that facility for the past three years, the greatest activity during the 1990–1992 period is discussed, and unexpected or unusual results are noted.

1943 (LA-SUB–93-231) **CTCN: Colloid transport code – nuclear: A user's manual.** Jain, R. Los Alamos National Lab., NM (United States). [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040570. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the CTCN computer code, designed to solve the equations of transient colloidal transport of radionuclides in porous and fractured media. This Fortran 77 package solves systems of coupled nonlinear differential-algebraic equations with a wide range of boundary conditions. The package uses the Method of Lines technique with a special section which forms finite-difference discretizations in up to four spatial dimensions to automatically convert the system into a set of ordinary differential equations. The CTCN code then solves these equations using a robust, efficient ODE solver. Thus CTCN can be used to solve population balance equations along with the usual transport equations to model colloid transport processes or as a general problem solver to treat up to four-dimensional differential-algebraic systems.

1944 (LA-UR–93-2201) **The Department of Energy Nevada Test Site Remote Area Monitoring System.** Sanders, L.D.; Hart, O.F. Los Alamos National Lab., NM (United States). 9 Jun 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9306222–2: 17. annual Army environmental R&D symposium and 3rd USACE innovative technology transfer, Williamsburg, VA (United States), 22-24 Jun 1993). Order Number DE93018562. Source: OSTI; NTIS; INIS; GPO Dep.

The Remote Area Monitoring System was developed by Los Alamos National Laboratory (LANL) for DOE test directors at the Nevada Test Site (NTS) to verify radiological conditions are safe after a nuclear test. In the unlikely event of a venting as a result of a nuclear test, this system provides radiological and meteorological data to Weather Service Nuclear Support Office (WSNSO) computers where mesoscale models are used to predict downwind exposure rates. The system uses a combination of hardwired radiation sensors and satellite based data acquisition units with their own radiation sensors to measure exposure rates in remote areas of the NTS. The satellite based data acquisition units are available as small, Portable Remote Area Monitors (RAMs) for rapid deployment, and larger, Semipermanent RAMs that can have meteorological towers. The satellite based stations measure exposure rates and transmit measurements to the GOES (Geostationary Operational Environmental Satellite) where they are relayed to Direct Readout Ground Stations (DRGS) at the NTS and Los Alamos. Computers process the data and display results in the NTS Operations Coordination Center. Los Alamos computers and NTS computers are linked together through a wide area network, providing remote redundant system capability. Recently, LANL, expanded the system to take radiological and meteorological measurements in communities in the western United States. The system was also expanded to acquire data from Remote Automatic Weather Stations (RAWS) that transmit through GOES. The addition of Portable and Semipermanent RAMs to the system has vastly expanded monitoring capabilities at NTS and can be used to take measurements anywhere in this hemisphere.

1945 (LA-UR–93-3419) **Infrared FEL photochemistry: Multiple-photon dissociation of Freon gas.** Newnam, B.E.; Early, J.W.; Lyman, J.L. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930855–8: 15. international free electron laser conference, The Hague (Netherlands), 23-27 Aug 1993). Order Number DE94000817. Source: OSTI; NTIS; GPO Dep.

Wavelength tunability, synchrotron sidebands, and picosecond pulse structure are inherent FEL characteristics that should be advantageous for photochemistry involving infrared multiple-photon photodissociation. Tuned to an absorption resonance, the FEL sideband structure will overlap the broad, excited-state spectral absorption and should lead to enhanced dissociation. The Los Alamos APEX FEL was operated with and without sidebands to

test this hypothesis on $CFCl_3$ (Freon 11), an inert chlorofluorocarbon widely used in refrigeration systems and one of the gases implicated as depleting the ozone in the Earth's stratospheric layer. The FEL wavelength was set at the C-Cl stretch absorption resonance at 11.8-μm, the oscillator cavity length was detuned first to minimize and then to maximize the spectral bandwidth, and the beam was focused through a pair of test cells (1.0 Torr Freon+1.7 Torr air). Comparison of final and initial absorbance spectra indicated the $CFCl_3$ photodissociation yield was 1.2% for the cell exposed with sideband spectra (3% FWHM) and 9-ns micropulse separation. Negligible effect was seen without sidebands, albeit at lower total beam fluence. Although the result of this single experiment is not large enough to be conclusive, it does provide a basis for optimizing the FEL temporal and spectral parameters to attain higher photodissociation yield in future tests.

1946 (LA-UR–93-3437) **The use of lidar for the evaluation of traffic-related urban pollution.** Eichinger, W.; Cooper, D.; Buttler, W.; Cottingame, W.; Tellier, L. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States); New Mexico State Government, Santa Fe, NM (United States); Federal Highway Administration, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930722–46: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94000704. Source: OSTI; NTIS; GPO Dep.

Lidar (Light Detection and Ranging) is demonstrated as a tool for the detection and tracking of sources of aerosol pollution. Existing elastic lidars have been used to demonstrate the potential of the application of this technology in urban areas. Data from several experiments is shown along with analysis methods used for interpretation of the data. The goal of the project is to develop a light-weight, low-cost, lidar system and data analysis methods which can be used by urban planners and local air quality managers. The ability to determine the sources, i.e. causes, of non-attainment may lead to more effective use of tax dollars. Future directions for the project are also discussed.

1947 (NEI-DK–1317, pp. 1-130) **Environmental problems arising from intercommunicating traffic systems between the Nordic countries: Partial report no. 1.** Lie, T. (Asplan Oestlandet As (Norway)); Nielsen, G. Nordisk Ministerraad. 1992. (In Norwegian). In *Nordic traffic and the environment.* 354p. Order Number DE94709609. Source: OSTI; NTIS.

A general survey of central environmental problems connected to the transportation sector and to disposal and production related to vehicles and to the infrastructure operation, and to changes in the infrastructure, based on a study of relevant literature. Initiatives for reducing the pollution caused by this sector are evaluated. The main problem is air pollution and regional spoilage such as acidification of surface waters and damage suffered by vegetation. An innovative method for describing pollution by traffic seen from the cradle to grave aspect is presented. It is reckoned that in the Nordic countries two million people are disturbed by traffic-noise pollution over 65 dBA and this can result in physical stresses which can in their turn lead to psychosomatic ailments. Road transport is responsible for 80-90% of total serious pollution from the transportation sector, mainly in relation to transport of persons. Urban areas have the most noise and air pollution, and conflicts over use of land for transport. Most sources of pollution within the transportation sector are currently not registered as causes. (AB) (194 refs.)

1948 (NEI-DK–1317, pp. 1-81) **Initiatives to tackle environmental problems caused by intercommunicating traffic systems in the Nordic countries: Partial report no. 2.** Lie, T. (Asplan Oestlandet As (Norway)); Nielsen, G. Nordisk Ministerraad. 1992. (In Norwegian). In *Nordic Traffic and the environment.* 254p. Order Number DE94709609. Source: OSTI; NTIS.

Initiatives taken with the aim of reducing the most important environmental problems related to intercommunicating traffic systems in the Nordic countries are described. These initiatives are evaluated from both long and short term perspectives. Initiatives concerned with individual forms of transport and those concerned with all forms of transport are described in detail. It is reckoned that air pollution can be reduced by 84%, pollution from wastes by 54%, noise pollution by 52%, energy consumption by 42%, consumption of natural resources by 36% and problems related to land use by 8%. The greatest reduction can be achieved in relation to technical improvements of vehicles, regulation of car traffic and redistribution of the transport of persons. Less specific activities generally have a higher level of effect with regard to pollution abatement. Tariffs are very effective. The most serious problems are local and global air pollution which, it is claimed, can be reduced by 84% and 54% respectively and energy consumption rates which can be reduced by 42%. (AB) (194 refs.)

1949 (NEI-SE–125, pp. 9-26) **Climate changes.** Karlen, W. (Stockholm Univ. (Sweden). Dept. of Physical Geography). Elforsk AB, Stockholm (Sweden). 1993. (In Swedish). In *Climate of the Earth - natural variations and man's influence.* 49p. Order Number DE94702215. Source: OSTI; NTIS.

Summary of the report on p. 1-8.

Possible causes for climate change are discussed, natural or caused by human activities. It is noted that several natural processes (e.g. circulation in oceans, clouds, aerosols, solar activities) have complex interactions with the climate that cause uncertainties in model calculations. Paleoclimates and historic climatic variations are reviewed, which indicate considerable temperature variations over time and regions. 88 refs.

1950 (NEI-SE–125, pp. 27-35) **The varying solar activity and its possible effect on the climate.** Friis-Christensen, E. (Danish Meteorological Inst. Copenhagen (Denmark)). Elforsk AB, Stockholm (Sweden). 1993. (In Swedish). In *Climate of the Earth - natural variations and man's influence.* 49p. Order Number DE94702215. Source: OSTI; NTIS.

Summary of the report on p. 1-8.

The influence on climate from solar activities are discussed in this article, e.g. the striking correspondence between mean temperatures and the length of the sunspot periods in the period 1750 - today. It is noted that the variations in energy radiation from the sun (0.1 per cent) is too small to affect the climate in a measurable way, but that interplay between solar variations and the changing atmospheric composition can have important effects on the climate. 21 refs.

1951 (NEI-SE–125, pp. 36-44) **What are climate models and climate data saying?.** Dahlstroem, B. (Swedish Meteorological and Hydrological Inst., Norrkoeping (Sweden)). Elforsk AB, Stockholm (Sweden). 1993. (In Swedish). In *Climate of the Earth - natural variations and man's influence.* 49p. Order Number DE94702215. Source: OSTI; NTIS.

Summary of the report on p. 1-8.

The climate models need improvement to reduce the uncertainty of climate changes the next century. The temperature increase suggested by IPCC is 5-10 times higher than the measured global temperature increase the last century. The models need better time and volume resolution to allow more realistic simulations, and better calculations of: clouds/precipitation, the hydrological cycle, atmospheric aerosols, exchange between earth surface and atmosphere, and biological couplings. It is important that our knowledge of climate change is improved, and recommended that Sweden should participate actively in international research to increase the understanding of these questions. 3 refs.

1952 (NILU-OR–67/92) **International global atmospheric chemistry (IGAC) program global emissions inventory activity (GEIA): Proceedings of the IGAC/GEIA workshop on global emission inventory.** Pacyna, J.M. (Norwegian Inst. for Air Research, Lillestroem (Norway)); Graedel, T.E. Norsk Inst. for Luftforskning, Lillestroem (Norway). Oct 1992. 134p. (CONF-9206407–: IGAC/GEIA workshop on global emission inventory, Lillestroem (Norway), 22-24 Jun 1992). Order Number DE94709728. Source: OSTI; NTIS.

In accordance with the work plan of the International Geosphere-Biosphere Program (IGBP)/International Global Atmospheric Chemistry (IGAC) Global Emission Inventory was organized by the GEIA Secretariat and the Norwegian Institute for Air Research (NILU). The workshop was attended by 34 participants from 9 countries and 3 international organizations. The overall goals of the workshop were to review the progress of work within individual

GEIA projects and to plan further activity, as well as to discuss new projects. Major focus was placed on projects related to emissions of acidic components, such as SO_2 and NO_x, and other nitrogen compounds, and volatile organic compounds (VOCs).

1953 (NUREG–1400) **Air sampling in the workplace: Final report.** Hickey, E.E. (Pacific Northwest Lab., Richland, WA (United States)); Stoetzel, G.A.; Strom, D.J.; Cicotte, G.R.; Wiblin, C.M.; McGuire, S.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Pacific Northwest Lab., Richland, WA (United States); Advanced Systems Technology, Inc., Atlanta, GA (United States). Sep 1993. 89p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This report provides technical information on air sampling that will be useful for facilities following the recommendations in the NRC's Regulatory Guide 8.25, Revision 1, "Air sampling in the Workplace." That guide addresses air sampling to meet the requirements in NRC's regulations on radiation protection, 10 CFR Part 20. This report describes how to determine the need for air sampling based on the amount of material in process modified by the type of material, release potential, and confinement of the material. The purposes of air sampling and how the purposes affect the types of air sampling provided are discussed. The report discusses how to locate air samplers to accurately determine the concentrations of airborne radioactive materials that workers will be exposed to. The need for and the methods of performing airflow pattern studies to improve the accuracy of air sampling results are included. The report presents and gives examples of several techniques that can be used to evaluate whether the airborne concentrations of material are representative of the air inhaled by workers. Methods to adjust derived air concentrations for particle size are described. Methods to calibrate for volume of air sampled and estimate the uncertainty in the volume of air sampled are described. Statistical tests for determining minimum detectable concentrations are presented. How to perform an annual evaluation of the adequacy of the air sampling is also discussed.

1954 (ORNL/CDIAC–34/R3) **Catalog of data bases and reports.** Oak Ridge National Lab., TN (United States). Carbon Dioxide Information Analysis Center. Jul 1993. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93040597. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4048.

This document provides information about the many reports and other materials made available by the US Department Energy's (DOE's) Global Change Research Program (GCRP). It is divided into eight sections plus author and title indexes: US Department of Energy Global Change Research Program Research plans and summaries, US Department of Energy Global Change Research Program technical reports, US Department of Energy Atmospheric Radiation Measurements (ARM) Program reports, other US Department of Energy reports, CDIAC reports, CDAIC numeric data and computer model distribution, USDA reports on response of vegetation to carbon dioxide, and other publications.

1955 (ORNL/TM–12452) **Models for close-in atmospheric dispersion, explosive releases, and particle deposition.** Bloom, S.G. Oak Ridge National Lab., TN (United States). 6 Oct 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002320. Source: OSTI; NTIS; GPO Dep.

Relatively simple models are presented to simulate close-in atmospheric dispersion, explosive releases, and particle deposition. Close-in generally refers to distances less than 50 m downwind from the source. These models assume simple gas dispersion (no chemical reactions, neutral buoyancy) and that particles behave as a gas expect they can be removed from the plume by a simple, deposition-velocity mechanism. These models have been combined into a QuickBASIC program (INEXPLC.BAS) and its PC executable form (INEXPLC.EXE). These programs, along with sample input and output files, are available from the author.

1956 (PNL–8812) **Sensitivity study of six public health risk computation cases from the US Department of Energy risk- and cost-estimate process pilot study.** Chamberlain, P.J. II; Droppo, J.G. Jr.; Castleton, K.J.; Eslinger, P.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000903. Source: OSTI; NTIS; GPO Dep.

This report contains a description of the results from the analysis of the sensitivity of estimated public health risks to changes in model parameters relating to the contaminant source releases, contaminant transports, and human exposures contaminants from six waste sites. Estimated public health risks associated with these and other sites at US Department of Energy (DOE) compounds were reported in a pilot study done by the Oak Ridge National Laboratory (ORNL) for the DOE (ORNL 1992). The objective of the sensitivity analysis was to identify the subset of model input parameters whose variations accounted for the majority of the variation in the computed public health risk values. All environmental modeling in this study and the pilot study done by ORNL (1992) was based on the Multimedia Environmental Pollutant Assessment System (Whelan et al. 1992). The results of the sensitivity analysis for the atmospheric case indicate that the most influential variables were emission rate and, to a lesser extent, population size. For groundwater cases, there was no consistent ordering of the influential variables. Depending on the case considered, some influential variables include the following: Equilibrium partition coefficient (K_d), size of population, pore water velocity, constituent inventory, contaminant flux rate from source, and thickness of saturated zone. For the overland transport case, the regression model fit was not adequate for a reliable identification of the influential variables.

1957 (PNL–8820) **Methodology for performing measurements to release material from radiological control.** Durham, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Gardner, D.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001079. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the existing and proposed methodologies for performing measurements of contamination prior to releasing material for uncontrolled use at the Hanford Site. The technical basis for the proposed methodology, a modification to the existing contamination survey protocol, is also described. The modified methodology, which includes a large-area swipe followed by a statistical survey, can be used to survey material that is unlikely to be contaminated for release to controlled and uncontrolled areas. The material evaluation procedure that is used to determine the likelihood of contamination is also described.

1958 (RFP–4763) **Comparison and evaluation of turbulence estimation schemes at Rocky Flats Plant.** Bowen, B.M.; Pamp, S.E. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-940115–1: 74. American Meteorological Society annual meeting, Nashville, TN (United States), 23-28 Jan 1994). Order Number DE94000515. Source: OSTI; NTIS; GPO Dep.

The Rocky Flats Plant (RFP) routinely measures meteorological data to support Air Quality and Emergency Response activities. These data help to characterize the transport and dispersion of actual or potential airborne releases of radionuclides or other hazardous materials.

1959 (RFP–4783) **Rocky Flats 1990–91 winter validation tracer study: Volume 1.** Brown, K.J. (North American Weather Consultants, Salt Lake City, UT (United States)). EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant; North American Weather Consultants, Salt Lake City, UT (United States). Oct 1991. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94001393. Source: OSTI; NTIS; GPO Dep.

During the winter of 1990–91, North American Weather Consultants (NAWC) and its subcontractor, ABB Environmental Services (ABBES), conducted a Winter Validation Study (WVS) for EG&G Rocky Flats involving 12 separate tracer experiments conducted between February 3 and February 19, 1991. Six experiments were

conducted during nighttime hours and four experiments were conducted during daytime hours. In addition, there was one day/night and one night/day transitional experiment conducted. The primary purpose of the WVS was to gather data to further the approval process for the Terrain Responsive Atmospheric Code (TRAC). TRAC is an atmospheric dispersion model developed and operated at the Department of Energy's (DOE's) Rocky Flats Plant (RFP) north of Denver, Colorado. A secondary objective was to gather data that will serve to validate the TRAC model physics.

1960 (SAND–93-0449C) **Practical application of in situ aerosol measurement.** O'Hern, T.J.; Rader, D.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9305278–1: Halon alternatives technical working conference, Albuquerque, NM (United States), 11-13 May 1993). Order Number DE93040346. Source: OSTI; NTIS; GPO Dep.

The use of in situ, real-time measurement techniques permits the characterization of airborne droplets and particles under conditions where traditional sampling methods can fail. For example, sampling method rely on the ability to sample and transport particles without biasing the properties of interest, and often are not applicable in harsh environment. Although in situ methods offer unique opportunities in these cases, these techniques introduce new concerns and must be used carefully if accurate measurement are to be made. Several in situ measurement techniques are reviewed here. As the field is rapidly evolving, the discussion is limited to those techniques which: (1) are commercially available, (2) provide real-time output, (3) measure the aerosol size distribution. Discussion is divided between single particle counters (which provide a flux-based or temporal measurement) and ensemble techniques (which provide a concentration-based or spatial measurement). Specific techniques discussed include phase Doppler, Mie scattering, and Fraunhofer diffraction, and commercial instruments based on these techniques.

1961 (SAND–93-1296C) **Ozone depletion, paradigms, and politics.** Iman, R.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9310203–1: 1993 American Society for Quality Control/American Statistics Association (ASQC/ASA) fall meeting, Rochester, NY (United States), 14-15 Oct 1993). Order Number DE94001600. Source: OSTI; NTIS; GPO Dep.

The destruction of the Earth's protective ozone layer is a prime environmental concern. Industry has responded to this environmental problem by: implementing conservation techniques to reduce the emission of ozone-depleting chemicals (ODCs); using alternative cleaning solvents that have lower ozone depletion potentials (ODPs); developing new, non-ozone-depleting solvents, such as terpenes; and developing low-residue soldering processes. This paper presents an overview of a joint testing program at Sandia and Motorola to evaluate a low-residue (no-clean) soldering process for printed wiring boards (PWBs). Such processes are in widespread use in commercial applications because they eliminate the cleaning operation. The goal of this testing program was to develop a data base that could be used to support changes in the mil-specs. In addition, a joint task force involving industry and the military has been formed to conduct a follow-up evaluation of low-residue processes that encompass the concerns of the tri-services. The goal of the task force is to gain final approval of the low-residue technology for use in military applications.

1962 (SIB-TN–33) **Climatic studies as a basis for physical planning.** Glaumann, M. National Swedish Inst. for Building Research, Gaevle (Sweden). Apr 1993. 143p. (In Swedish). Order Number DE94709824. Source: OSTI; NTIS.

This report consists of commentaries on, and summaries of 9 studies in the field of "building climatology." The common aim of the papers is to map local climate conditions and to improve the planning of outdoor environments and to create more energy efficient buildings. The basis for the studies has been provided by a series of advanced full scale measurements of temperature, wind and radiation made simultaneously at more than 20 points in building environments. The ambition has been to translate the results into practical advice and models for planning. Eight of the studies are concerned with wind in different physical environments. New measurement criteria for the evaluation of wind environment and two methods for calculating wind conditions are presented. The last paper deals with the energy balance of a glazed atrium roof. (author) figs., tabs., refs.

1963 (SNV–4094) **Air monitoring in the Arctic.** Heintzenberg, J. (Stockholm Univ. (Sweden). Dept. of Meteorology); Holmen, K.; Odh, S.Aa.; Engardt, M. Swedish Environmental Protection Agency, Solna (Sweden). 1992. 32p. Order Number DE94709796. Source: OSTI; NTIS.

We report the data for 1991 of the Swedish baseline station which is operated in the Norwegian air chemistry station on Zeppelinfjaellet near Ny-Alesund, Spitsbergen. The measured atmospheric parameters are CO_2 concentrations, particle concentrations in two size ranges, light scattering coefficient at 0.55 μm wavelength and aerosol composition. As complementary meteorological data we report air pressure and temperature and the horizontal wind vector. 1991 was the first year of continuous baseline measurements on Zeppelinfjaellet. Thus, we refrained from evaluating systematic trends and interannual comparison. 6 refs, 6 tabs.

1964 (SNV–4178) **Emission to the atmosphere of acidifying substances 1991.** Swedish Environmental Protection Agency, Solna (Sweden). 1993. 18p. (In Swedish). Order Number DE94709801. Source: OSTI; NTIS.

The emission of SO_2 and NO_x in sweden 1991 amounted to 107 and 388 ktons respectively, representing a reduction compared to the emissions in 1980 with 79 and 8 % respectively. The reduction of SO_2 emission is caused primarily by a switch to low-sulfur fuel oil, encouraged by an environmental tax on sulfur. In the report, data on the emissions are broken down for the different activities causing the emissions. Test results of emissions from 23 new car models (1991), and for 3 cars of 1989 model. 14 refs, 6 figs, 8 tabs.

1965 (SVF–470) **Continuous monitoring of ammonia emissions.** Axelsson, H. (Vattenfall Utveckling AB (Sweden)); Brunstrum, C.; Johansson, A. Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 105p. (In Swedish). Order Number DE94709788. Source: OSTI; NTIS.

The main and most important results of this project can be summarized as follows: The two instrument concepts, diode laser gas sensor and DOAS, have been developed to field prototypes which at the monitoring applications operated with adequate sensitivity such that the measurements gave information about the absolute level of ammonia concentration as a function of time. 41 refs, 48 figs, 6 tabs.

1966 (SVF–471) **Stack gas flow determination by measurements or calculations - practical comparison for boiler with solid fuel mixtures.** Sjoeberg, M. (Vattenfall Utveckling AB, Vaellingby (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 31p. (In Swedish). Order Number DE94709789. Source: OSTI; NTIS.

This study compares different methods to calculate NO-emissions, using a peat- and wood chips fuelled boiler as a district heating plant as an example. The boiler was equipped with a monitoring system that allowed several emission calculation methods to be used simultaneously, to study any differences between them. The methods have been compared to each other by simulating variations in fuel, measured and assumed data and comparing the outcome of the different methods. One conclusion of the study is that a monitoring system measuring on dry basis is the best choice for plants using solid fuels with varying water content, if the stack gas flow is to be calculated. If a calculated fuel flow is used to calculate the stack gas flow it is very important that the generated heat is measured correctly and that the correct calorific value of the fuel is used in the calculations. Variations in peat/wood balance in the fuel have only minor influence on the result, if both fuels have the same water content. Influence of fuel composition etc is avoided if the stack gas flow is measured directly and combined with NO-measurement on wet basis. The flowmeter must however be of good quality which normally means substantial extra costs for installation and maintenance. The results also show that the recommendation from the Swedish Environmental Protection Board, to

calculate rather than measure the stack gas flow whenever possible, is relevant to this plant type, providing the assumptions for fuel composition and heat losses are correct for the average of the operating season, or updated whenever they change. 2 refs, 1 fig, 1 tab.

1967 (UCRL-ID–114164) **Plutonium dispersal in fires: Summary of what is known.** Condit, R.H. Lawrence Livermore National Lab., CA (United States). Jul 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000353. Source: OSTI; NTIS; GPO Dep.

In view of the great public apprehension about plutonium and nuclear weapons we should explore ways to prevent, limit, or mitigate possible plutonium dispersals. This review is primarily a tutorial on what is known about plutonium dispersal in fires. It concludes that in most types of fires involving plutonium the amount released will not be an immediate danger to life. Indeed, in many cases very few personnel will receive more than the lung burden allowed by current regulations for plutonium workers. However, the dangers may be significant in special situations, unusual terrains, certain meteorological conditions, and very high burn temperatures.

1968 (UCRL-ID–115041) **NASA HSRP Emissions Scenarios Committee meeting, June 7, 1993.** Wuebbles, D.J.; Seals, R.M. Lawrence Livermore National Lab., CA (United States). 12 Aug 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001857. Source: OSTI; NTIS; GPO Dep.

This primary purpose of this plan is to establish a process to ensure data integrity in the process of assembling aircraft emission scenario data sets from component data developed and provided by various sources. A component data set is one for a particular aircraft use (i.e. scheduled airline). A scenario data set is an ensemble set for a particular time. A secondary purpose is to help identify possible discrepancies or inconsistencies in the component data sets developed elsewhere or in the scenario data sets. This plan covers activities involved in assembling aircraft emission scenario data sets and by the component data set producers in supplying information to support evaluation of the component data sets. It does not cover work by the data producers to validate their work in developing the component data sets or to establish the fundamental soundness of the component data sets.

1969 (UCRL-JC–112273) **Global emissions and models of photochemically active compounds.** Penner, J.E. (Lawrence Livermore National Lab., CA (United States)); Atherton, C.S.; Graedel, T.E. Lawrence Livermore National Lab., CA (United States). 20 May 1993. 28p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. Grant NAGW-1827. (CONF-930443–1: 1. international global atmospheric chemistry project conference, Elat (Israel), 18-22 Apr 1993). Order Number DE93040490. Source: OSTI; NTIS; INIS; GPO Dep.

Anthropogenic emissions from industrial activity, fossil fuel combustion, and biomass burning are now known to be large enough (relative to natural sources) to perturb the chemistry of vast regions of the troposphere. A goal of the IGAC Global Emissions Inventory Activity (GEIA) is to provide authoritative and reliable emissions inventories on a 1° x 1° grid. When combined with atmospheric photochemical models, these high quality emissions inventories may be used to predict the concentrations of major photochemical products. Comparison of model results with measurements of pertinent species allows us to understand whether there are major shortcomings in our understanding of tropospheric photochemistry, the budgets and transport of trace species, and their effects in the atmosphere. Through this activity, we are building the capability to make confident predictions of the future consequences of anthropogenic emissions. This paper compares IGAC recommended emissions inventories for reactive nitrogen and sulfur dioxide to those that have been in use previously. We also present results from the three-dimensional LLNL atmospheric chemistry model that show how emissions of anthropogenic nitrogen oxides might potentially affect tropospheric ozone and OH concentrations and how emissions of anthropogenic sulfur increase sulfate aerosol loadings.

1970 (UCRL-JC–113194) **Non-thermal discharge processing of gaseous pollutants.** Vogtlin, G.; Penetrante, B.; Wallman, H. Lawrence Livermore National Lab., CA (United States). 27 Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309218–2: 11. ozone world congress, San Francisco, CA (United States), 1 Sep 1993). Order Number DE93040850. Source: OSTI; NTIS; GPO Dep.

The electrical discharge techniques, called non-thermal, utilize high voltage breakdown of gases using short pulses of one to a few hundred nanoseconds. These short pulses between metal electrodes generate energetic electrons without appreciable thermal heating of the gas. The energetic electrons collide with gas molecules to form radicals. The radicals then react with pollutants to form harmless compounds. Our experimental device uses a wire in a pipe geometry. The wire is driven by a 40 kilovolt pulse 100 nanoseconds long. Gas is circulated in a loop through the pipe geometry in a closed system. This system permits the introduction of various gas combinations prior to testing. The recirculated gas can be heated to determine the effect on the electrical discharge, and chemical reactions. The efficiency of pollutant removal is the key to applications. We have been able to significantly improve the efficiency of NO removal by the addition of hydrocarbons. Nitric oxide has been removed with an energy cost of 15 ev per NO molecule. We believe the hydrocarbon additive serves by recycling the hydroxyl radicals during the oxidation and reduction of NO. The implementation of this process will depend largely on how much additives, electrical power consumption, and final NO_x concentration are acceptable for a particular application.

1971 (UCRL-JC–114028) **Some thoughts on the evaluation of long-range dispersion models in the context of emergency response.** Rodriguez, D. (Lawrence Livermore National Lab., CA (United States)); Walker, H.; Klepikova, N.; Kostrikov, A. Lawrence Livermore National Lab., CA (United States). 14 May 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930810–9: Topical meeting on environmental transport and dosimetry, Charleston, SC (United States), 31 Aug - 3 sep 1993). Order Number DE94001041. Source: OSTI; NTIS; GPO Dep.

The Chernobyl reactor accident and the possibility of a similar event of equal or greater magnitude in the future suggest the need for long-range atmospheric transport and diffusion models. Assuming their ability to accurately predict the temporal and spatial distributions of a complex mixture of radionuclides, these models can provide indispensable information to emergency planners and responders as well as information to a concerned and increasingly well-informed public. Models designed for use in real-time, emergency response situations can be evaluated on the basis of accuracy, responsiveness, costs, and growth potential. Among these criteria, accuracy is paramount; without the ability to accurately determine the patterns of concentration in both space and time, all other critical measures of performance become irrelevant. The authors are in the process of evaluating the accuracy of two long-range, emergency response models – one based on the particle-in-cell method of pollutant representation (ADPIC/US) and the other based on the superposition of Gaussian puffs released periodically in time (EXPRESS/Russia) – using data obtained from 20 releases of perfluorocarbon tracers in January, 1987, during the Across North America Tracer Experiment (ANATEX). The purpose is to assess the current capabilities for stimulating continental-scale dispersion processes and to use these assessments as a means to improve the modeling tools. The model evaluations discussed here utilize performance measures tailored to the ANATEX field experiment. The design of a sampling network, programmatic requirements and resource limitations associated with a field experiment affect the choice of evaluation techniques. Several appropriate measures, many of which depend on the characterization of surface concentration "footprints," have been identified or devised.

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Refer also to citation(s) 156, 167, 243, 246, 257, 262, 277, 289, 290, 321, 323, 324, 332, 333, 334, 353, 357, 358, 371, 375, 380, 381, 382, 383, 385, 386, 388, 390, 392, 394, 396, 397, 398, 400, 401, 402, 403, 404, 405, 406, 407, 408, 410, 412, 413, 414, 415, 418, 420, 422, 423, 424, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 442, 443, 448, 449, 451, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 471, 472, 473, 520, 1190, 1200, 1201, 1202, 1203, 1206, 1287, 1374, 1378, 1379, 1664, 1760, 1762, 1894, 1896, 1907, 1908, 1909, 1957, 2184, 2185, 2186, 2197, 2242, 2278, 2592, 2607, 2845, 2848, 2851

1972 (ANL/CMT/CP–79321) **Preliminary results from the investigation of thermal effects in electrokinetics soil remediation.** Krause, T.R.; Tarman, B. Argonne National Lab., IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309146–3: 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management, Atlanta, GA (United States), 27-29 Sep 1993). Order Number DE94000443. Source: OSTI; NTIS; INIS; GPO Dep.

Electrokinetics is an emerging soil remediation technology. Contaminants are extracted from the soil as a result of a complex set of phenomena that occur when an electric gradient is imposed across a soil-water system. The primary phenomena include electroosmosis, electromigration, and electrophoresis. Secondary phenomena, such as changes in solubility or speciation of various chemical components, may occur as a result of electrically induced changes in the chemical environment of the system. Numerous factors, such as temperature, may affect each of these phenomena and, consequently, the overall process efficiency. We have begun an investigation of thermal effects in the extraction of potassium dichromate from kaolinite soils under conditions of constant saturation and dewatering. Preliminary results suggest that increasing the soil temperature from 21 to 55°C may decrease the processing time under saturated conditions. However, increasing the soil temperature under dewatering, conditions causes soil cracking, which reduces the overall process efficiency.

1973 (ANL/EA/CP–79679) **RESRAD-CHEM: A computer code for chemical risk assessment.** Cheng, J.J.; Yu, C.; Hartmann, H.M.; Jones, L.G.; Biwer, B.M.; Dovel, E.S. Argonne National Lab., IL (United States). Oct 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–40: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002214. Source: OSTI; NTIS; GPO Dep.

RESRAD-CHEM is a computer code developed at Argonne National Laboratory for the U.S. Department of Energy to evaluate chemically contaminated sites. The code is designed to predict human health risks from multipathway exposure to hazardous chemicals and to derive cleanup criteria for chemically contaminated soils. The method used in RESRAD-CHEM is based on the pathway analysis method in the RESRAD code (1,2) and follows the U.S. Environmental Protection Agency's (EPA's) guidance on chemical risk assessment (3). RESRAD-CHEM can be used to evaluate a chemically contaminated site and, in conjunction with the use of the RESRAD code, a mixed waste site.

1974 (ANL/EAIS/CP–80710) **Adaptive sampling program support for expedited site characterization.** Johnson, R. Argonne National Lab., IL (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–7: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94000468. Source: OSTI; NTIS; INIS; GPO Dep.

Expedited site characterizations offer substantial savings in time and money when assessing hazardous waste sites. Key to some of these savings is the ability to adapt a sampling program to the "real-time" data generated by an expedited site characterization. This paper presents a two-prong approach to supporting adaptive sampling programs: a specialized object-oriented database/geographical information system for data fusion, management and display; and combined Bayesian/geostatistical methods for contamination extent estimation and sample location selection.

1975 (CEA-CONF–11518) **Experimental studies about the distribution between soil and crops of small particles fallout.** Camus, H.; Gauthier, D.; Caput, C.; Soyer, C.; Escariot, R. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (In French). (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604283. Source: OSTI; NTIS (US Sales Only); INIS.

These studies are performed to quantify the distribution between soil and crops of the micron-size particles generated during a major accidental release. Works are done in open fields. We have chosen the size of the particles to simulate the situation of the environment like in the not immediately near field. The results are very dispersed, function of the vegetals types and of the season. At first, we expose some generalities about the experimental techniques; then the results and finally we comment and specify the limits of use of that kind of data. 3 figs., 2 tabs.

1976 (CNIC–00688) **Study on ^{137}Cs adsorption by soils around Qingshan and Daya Bay Nuclear Power Plants.** Lu Zixian (Institute for application of atomic Energy, CAAS, Beijing (China)); Xu Shiming. China Nuclear Information Centre, Beijing, BJ (China). Oct 1992. 9p. (In Chinese). (CSNAS–0065.). Order Number DE94604431. Source: OSTI; NTIS (US Sales Only); INIS.

The patterns of ^{137}Cs adsorption and percolation are studied by ^{137}Cs solution through soil cylinder samples collected from seven sites around Qingshan and Daya Bay Nuclear Power Plant. The top soils (0 $\approx$ 20 cm) are put into plastic tubes after being sieved. Three different ways are taken in the experiments. (1) ^{137}Cs solutions with the same specific activity (3.7×10^4 Bq/L) and same volume (40 mL) pass through the soils. (2) ^{137}Cs solutions with different specific activity (3.7×10^3, 3.7×10^4, and 3.7×10^5 Bq/L) and with same volume (40 mL) pass through the soils. (3) ^{137}Cs solutions with same specific activity (3.7×10^4 Bq/L) and with different volumes (40, 80, 120 mL) pass through the soils. The results show that the relationships of specific activity on the top 1 cm soil to the specific activity of solution is conformed to $y = Ax^B$, to the volume of solution is conformed to $y = A + Bx$. The upper 0 to 1 cm soil adsorbs ^{137}Cs over 90-95%, and upper 0-5 cm soil adsorbs 100% ^{137}Cs. When the depth is greater than 5 cm the activity of filtered solution is background. From this experiment, it shows that the contamination can be eliminated by removing top soil when the soil is contaminated by ^{137}Cs solution.

1977 (CONF-9310205–1) **Integrating state-of-the-science technology for a cost-effective hazardous waste site characterization.** Muhr, C.A. (Oak Ridge National Lab., Grand Junction, CO (United States)); Dickerson, K.S.; Korte, N.E. Oak Ridge National Lab., TN (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 7. annual Colorado Hazardous Waste Society conference and exhibition; Denver, CO (United States); 13-15 Oct 1993. Order Number DE94002196. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory's Environmental Technology Section in Grand Junction, Colorado has performed numerous hazardous waste site characterization since 1985. One of the most costly aspects of site characterization is the installation of groundwater monitoring wells and the subsequent long-term sampling and analysis costs. By optimizing the location of monitoring wells, better information can be obtained from fewer points, resulting in considerable cost savings to the project. A number of different screening techniques can be used prior to monitoring well installation allowing optimal well and soil-boring placement. Additionally, these screening techniques can provide a large amount of data in a small area to provide insight into local heterogeneities in the subsurface. Several screening techniques have been used by ORNL to accomplish these goals including: (1) geophysical surveys (electromagnetic and magnetic) conducted with the UltraSonic Ranging and Data System (USRADS®), (2) installation of temporary monitoring wells, (3) analysis of samples in the field with a gas

chromatograph (GC), and (4) use of the colloidal borescope for determining groundwater flow directions and velocities.

1978 (DOE/EA–0835) **Construction of the Savannah River Ecology Laboratory Conference Center: Environmental Assessment.** USDOE Savannah River Operations Office, Aiken, SC (United States). Jul 1993. 23p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93017298. Source: OSTI; NTIS; INIS; GPO Dep.

This Environmental Assessment (EA) reviews the environmental consequences associated with the proposed action of granting a site use permit to construct and operate a conference center on an approximately 70-acre tract of land on the Savannah River Site (SRS). While the proposed action requires an administrative decision by DOE, this EA reviews the linked action of physically constructing and operating a conference center. The SRS is a DOE-owned nuclear production facility encompassing approximately 200,000 acres in southwestern South Carolina. The proposed conference center would have an area of approximately 4,000 square feet, and would infrequently accommodate as many as 150 people, with the average being about 20 people per day. In addition to the No-Action alternative, under which the Research Foundation would not require the 70-acre tract of SRS land for a conference center, this EA considers site preservation. Under Site Preservation only minimal activities necessary to the SRS mission would occur, thereby establishing the lower limits of environmental consequences. A review conducted under the SRS permitting process identified no other forms of possible site development. Similarly, SRS areas identified in the Nuclear Complex Reconfiguration Site Proposal (DOE, 199la) do not include the conference center site area in proposed weapons complex reconfiguration activities. As a consequence, this EA does not consider other forms of possible site development as alternatives. The potential environmental consequences associated with the action of constructing and operating a conference center include impacts to cultural resources and impacts from construction activities, primarily related to land clearing (5 to 10 acres) and providing access to the site.

1979 (DOE/OR/00033–T546) **Mechanisms of bacterially catalyzed reductive dehalogenation.** Picardal, F.W. Oak Ridge Inst. for Science and Education, TN (United States); Arizona Univ., Tucson, AZ (United States). 1992. 323p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000840. Source: OSTI; NTIS; GPO Dep.

Nine bacteria were tested for the ability to dehalogenate tetrachloromethane (CT), tetrachloroethene (PCE), and 1, 1, 1-trichloroethane (TCA) under anaerobic conditions. Three bacteria were able to reductively dehalogenate CT. Dehalogenation ability was not readily linked to a common metabolism or changes in culture redox potential. None of the bacteria tested were able to dehalogenate PCE or TCA. One of the bacteria capable of dehalogenating CT, Shewanella putrefaciens, was chosen as a model organism to study mechanisms of bacterially catalyzed reductive dehalogenation. The effect of a variety of alternate electron acceptors on CT dehalogenation ability by S. putrefaciens was determined. oxygen and nitrogen oxides were inhibitory but Fe (III), trimethylamine oxide, and fumarate were not. A model of the electron transport chain of S. putrefaciens was developed to explain inhibition patterns. A period of microaerobic growth prior to CT exposure increased the ability of S. putrefaciens to dehalogenate CT. A microaerobic growth period also increased cytochrome concentrations. A relationship between cytochrome content and dehalogenation ability was developed from studies in which cytochrome concentrations in S. putrefaciens were manipulated by changing growth conditions. Stoichiometry studies using ^{14}C-CT suggested that CT was first reduced to form a trichloromethyl radical. Reduction of the radical to produce chloroform and reaction of the radical with cellular biochemicals explained observed product distributions. Carbon dioxide or other fully dehalogenated products were not found.

1980 (DOE/OR/00033–T567) **The effects of temperature and motility on the advective transport of a deep subsurface bacteria through saturated sediment.** McCaulou, D.R. (Arizona Univ., Tucson, AZ (United States)). Oak Ridge Associated Universities, Inc., TN (United States); Arizona Univ., Tucson, AZ (United States). 1993. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033 ;FG02-91ER61200. Order Number DE94001410. Source: OSTI; NTIS; INIS; GPO Dep.

Replicate column experiments were done to quantify the effects of temperature and bacterial motility on advective transport through repacked, but otherwise unaltered, natural aquifer sediment. The bacteria used in this study, A0500, was a flagellated, spore-forming rod isolated from the deep subsurface at DOE's Savannah River Laboratory. Motility was controlled by turning on flagellar metabolism at 18°C but off at 40°C. Microspheres were used to independently quantify the effects of temperature on the sticking efficiency (α), estimated using a steady-state filtration model. The observed greater microsphere removal at the higher temperature agreed with the physical-chemical model, but bacteria removal at 18°C was only half that at 4°C. The sticking efficiency for non-motile A0500 (4°C) was over three times that of the motile A0500 (18°C), 0.073 versus 0.022 respectively. Analysis of complete breakthrough curves using a non-steady, kinetically limited, transport model to estimate the time scales of attachment and detachment suggested that motile A 0500 bacteria traveled twice as far as non-motile A 0500 bacteria before becoming attached. Once attached, non-motile colloids detached on the time scale of 9 to 17 days. The time scale for detachment of motile A0500 bacteria was shorter, 4 to 5 days. Results indicate that bacterial attachment was reversible and detachment was enhanced by bacterial motifity. The kinetic energy of bacterial motility changed the attachment-detachment kinetics in favor of the detached state. The chemical factors responsible for the enhanced transport are not known. However, motility may have caused weakly held bacteria to detach from the secondary minimum, and possibly from the primary minimum, as described by DLVO theory.

1981 (DOE/OR/21607–T7) **An assessment of PCB degradation by microogransims including methods for measuring mineralization.** Hadden, C.; Edenborn, H.; Osborne, T.; Holdsworth, G.; Revis, N. Oak Ridge Research Inst., TN (United States). [1990]. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21607. Order Number DE94000861. Source: OSTI; NTIS; INIS; GPO Dep.

These studies sought to isolate and identify organism(s) from PCB contaminated soil and sediment that degrade PCB; to provide information on the potential of organisms in soil samples taken from a PCB-contaminated area to mineralize or dechlorinate PCB congeners; to assess potential enhancement of PCB biodegradation as a result of nutritional amendment of the samples; and to carry out analyses of successive lysimeter samples to determine whether field treatments have had an effect on the capacity of soil microbes to mineralize PCBS. We have expended considerable effort to validate the fractionation procedure used to assess mineralization and conversion of PCB substrates. The assessment relies on the ability to measure [^{14}C]-labeled CO_2 in the presence of potentially volatile [^{14}C]-labeled PCB and degradation products to differentiate between volatile and non-volatile [^{14}C]-labeled compounds between water-soluble products of metabolism and a mixture of unchanged substrate and other water-insoluble products and between metabolism and loss or non-extractability of the substrate.

1982 (DOE/RL–92-29) **Hanford 200 Areas Development Plan.** Rinne, C.A.; Daly, K.S. USDOE Richland Operations Office, WA (United States). Aug 1993. 173p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001179. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Hanford 200 Areas Development Plan (Development Plan) is to guide the physical development of the 200 Areas (which refers to the 200 East Area, 200 West Area, and 200 Area Corridor, located between the 200 East and 200 West Areas) in accordance with US Department of Energy (DOE) Order 4320.IB (DOE 1991a) by performing the following: Establishing a land-use plan and setting land-use categories that meet the needs of existing and proposed activities. Coordinating existing, 5-year, and long-range development plans and guiding growth in accordance with those plans. Establishing development guidelines to encourage cost-effective development and minimize conflicts between adjacent activities. Identifying site development issues that need

further analysis. Integrating program plans with development plans to ensure a logical progression of development. Coordinate DOE plans with other agencies [(i.e., Washington State Department of Ecology (Ecology) and US Environmental Protection Agency (EPA)]. Being a support document to the Hanford Site Development Plan (DOE-RL 1990a) (parent document) and providing technical site information relative to the 200 Areas.

1983 (DOE/RL–93-19) **Hanford Site Development Plan.** Hathaway, H.B.; Daly, K.S.; Rinne, C.A.; Seiler, S.W. Westinghouse Hanford Co., Richland, WA (United States). May 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001172. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Development Plan (HSDP) provides an overview of land use, infrastructure, and facility requirements to support US Department of Energy (DOE) programs at the Hanford Site. The HSDP's primary purpose is to inform senior managers and interested parties of development activities and issues that require a commitment of resources to support the Hanford Site. The HSDP provides an existing and future land use plan for the Hanford Site. The HSDP is updated annually in accordance with DOE Order 4320.1B, Site Development Planning, to reflect the mission and overall site development process. Further details about Hanford Site development are defined in individual area development plans.

1984 (EGG–2678(92)) **Drinking Water Program 1992 annual report.** Andersen, B.D.; Peterson-Wright, L.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1993. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002897. Source: OSTI; NTIS; INIS; GPO Dep.

EG&G Idaho, Inc., initiated a monitoring program for drinking water in 1988 for the US Department of Energy at the Idaho National Engineering Laboratory. EG&G Idaho structured this monitoring program to ensure that they exceeded the minimum regulatory requirements for monitoring drinking water. This program involves tracking the bacteriological, chemical, and radiological parameters that are required for a "community water system" (maximum requirements). This annual report describes the drinking water monitoring activities conducted at the 17 EG&G Idaho operated production wells and 11 distribution systems. It also contains all of the drinking water parameters that were detected and the regulatory limits that were exceeded during 1992. In addition, ground water quality is discussed as it relates to contaminants identified at the wellhead for EG&G Idaho production wells.

1985 (EGG-EEL–10752) **Siting study for Test Area North potable water deep well project.** Hubbell, J.M.; Wylie, A.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002808. Source: OSTI; NTIS; INIS; GPO Dep.

This study was conducted to evaluate the suitability of various locations for a new potable ground water well at Test Area North (TAN). The new well is proposed to replace two existing wells located within a trichloroethylene (TCE) plume. Several locations were evaluated using computer simulations based on the hydrogeology of the site. The modeling effort involved: (1) producing a water table map, (2) superimposing the effects of pumping the proposed new production well on the water table map using the model CAPZONE, and (3) calculating the capture zone for these wells using the GWPATH model. A three dimensional contaminant transport model was used to evaluate siting a well in a deeper horizon of the aquifer. The following scenarios were investigated: (1) placing a new well 500 ft north of the existing wells; (2) locating a well 3,000 ft northwest of the existing wells; (3) deepening one of the existing wells 100 to 150 ft to produce water from beneath an interbed that acts as a hydraulic barrier; and (4) drilling a new well about 500 ft northwest of the existing wells to produce water from beneath the interbed. The recommended new well site (fourth scenario) is northwest of the existing wells, with the well completed from 500 to 600 ft below land surface to produce water from beneath the Q-R interbed. Locating the well northwest of the existing wells places the new well out of the TCE plume and reduces the possibility of transporting contaminated water across the interbed.

1986 (EGG-ERD–10453) **Remedial investigation/feasibility study Work Plan and addenda for Operable Unit 4-12: Central Facilities Area Landfills II and III at the Idaho National Engineering Laboratory.** Keck, K.N.; Stormberg, G.J.; Porro, I.; Sondrup, A.J.; McCormick, S.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 1148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002883. Source: OSTI; NTIS; INIS; GPO Dep.

This document is divided into two main sections the Work Plan and the addenda. The Work Plan describes the regulatory history and physical setting of Operable Unit 4-12, previous sampling activities, and data. It also identifies a preliminary conceptual model, preliminary remedial action alternatives, and preliminary applicable or relevant and appropriate requirements. In addition, the Work Plan discusses data gaps and data quality objectives for proposed remedial investigation activities. Also included are tasks identified for the remedial investigation/feasibility study (RI/FS) and a schedule of RI/FS activities. The addenda include details of the proposed field activities (Field Sampling Plan), anticipated quality assurance activities (Quality Assurance Project Plan), policies and procedures to protect RI/FS workers and the environment during field investigations (Health and Safety Plan), and policies, procedures, and activities that the Department of Energy will use to involve the public in the decision-making process concerning CFA Landfills II and III RI/FS activities (Community Relations Plan).

1987 (EGG-WTD–10660) **Definition and compositions of standard wastestreams for evaluation of Buried Waste Integrated Demonstration treatment technologies.** Bates, S.O. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002841. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) Project was organized at the Idaho National Engineering Laboratory to support research, development, demonstration, testing, and evaluation of emerging technologies that offer promising solutions to remediation of buried waste. BWID will identify emerging technologies, screen them for applicability to the identified needs, select technologies for demonstration, and then evaluate the technologies based on prescribed performance objectives. The technical objective of the project is to establish solutions to Environmental Restoration and Waste Management's technological deficiencies and improve baseline remediation systems. This report establishes a set of standard waste stream compositions that will be used by BWID to evaluate the emerging technologies. Five waste streams are proposed that use four types of waste and a nominal case that is a homogenized combination of the four wastes. The five waste streams will provide data on the compositional extremes and indicate the technologies' effectiveness over the complete range of expected waste stream compositions.

1988 (ES/ER/TM–36) **Environmental restoration and waste management Site-Specific Plan for the Oak Ridge Reservation: FY 1993.** Science Applications International Corp., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States); USDOE Oak Ridge Field Office, TN (United States). 15 Jan 1993. 325p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001 ;AC05-84OR21400. Order Number DE94000601. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) is committed to achieving and maintaining environmental regulatory compliance while responding to public concerns and emphasizing waste minimization. DOE publishes the Environmental Restoration and Waste Management Five-Year Plan (FYP) annually to document its progress towards these goals. The purpose of this Site-Specific Plan (SSP) is to describe the activities undertaken to implement the FYP goals at the DOE Oak Ridge Field Office (DOE/OR) installations and programs specifically for the Oak Ridge Reservation (ORR) and surrounding areas. This SSP addresses activities and goals to be accomplished during FY93 even through the FYP focuses on FY94.

1989 (EUR–14690, pp. 15-24) **Effects of humic substances on the migration of radionuclides: complexation of actinides with humic substances.** Kim, J.I. (Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie); Buckau, G. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of the present research programme is to study the complexation behaviour of actinide ions with humic substances in natural aquifer systems and hence to quantify the effect of humic substances on the actinide migration. Aquatic humic substances commonly found in all groundwaters in different concentrations have a strong tendency towards complexation with actinide ions. This is one of the major geochemical reactions but hitherto least quantified. Therefore, the effect of humic substances on the actinide migration is poorly understood. In the present research programme the complexation of actinide ions with humic substances will be described thermodynamically. This description will be based on a model being as simple as possible to allow an easy introduction of the resulting constants into geochemical modelling of the actinide migration. 13 refs.

1990 (EUR–14690, pp. 25-38) **The role of colloids in the transport of radioelements by groundwater.** Skytte Jensen, B. (Risoe National Lab., Roskilde (Denmark). Environmental Science and Technology Dept.); Halken, T. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

An unsettled problem in migration studies is to what extent do colloids take part in the transport of elements with flowing groundwater. Numerous experimental studies have clearly demonstrated that colloids are able to adsorb traces of foreign elements including the actinide ions present in solution, and simple models adequate for the specific experimental conditions may be established. There are, however, not enough data available to model the overall behaviour of 'colloid-complexes' under highly variable natural conditions, where competition for adsorption and flocculation phenomena complicate the simple models. It is the intention of the present project to perform experiments directed at obtaining the missing information and secondly to establish a model, if possible, which may be used for predictive purposes. 3 refs., 4 figs., 5 tabs.

1991 (EUR–14690, pp. 39-47) **Colloid migration in groundwaters: geochemical interactions of radionuclides with natural colloids.** Kim, J.I. (Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie); Delakowitz, B. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this joint research programme is to determine the significance of groundwater colloids in far field radionuclide migration. This is based on the characterization, quantification and theoretical interpretation of colloidal transport of radionuclides in selected Gorleben aquifer systems. These aquifers were chosen for their well characterized hydrological and geological properties and because they contain substantial colloids of different chemical compositions in addition to considerable quantities of chemical homologues for the tri-, tetra- and hexavalent actinides. The research tasks are being investigated jointly by the four laboratories listed below: TUM: Technische Universaet Muenchen, F.R.G. (coordinator: J.I. Kim, B. Delakowitz) AEA: AEA Technology, Harwell, U.K. (M. Ivanovitch), GSF: Gesellschaft fuer Strahlen-und Umweltforschung, Muenchen, F.R.G. (P. Fritz), Atkins ES: W.S. Atkins Engineering Sciences, Epsom, U.K. (D. Read). The work programme contains: 1. Sampling of groundwaters, colloids and sediments under well controlled conditions (TUM, AEA, GSF), 2. Characterization of colloids, groundwaters and sediments (TUM, AEA, GSF), 3. Generation of pseudocolloids of radionuclides ($Z \geq 3^+$): Am(Eu) for M(III), Pu(Th) for M(IV), Np for M(V), U for M(VI); (TUM), 4. Studying of transport processes by scaled column experiments (GSF, TUM, AEA, Atkins ES), 5. Synthesis and theoretical interpretation (Atkins ES), 6. Liaison with related studies within the MIRAGE programme (Migration of Radionuclides in the geosphere). 8 refs.

1992 (EUR–14690, pp. 51-61) **The role of colloids in the transport of radionuclides in geological media.** Moulin, V. (CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets). Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

The main objective of this programme is to understand how colloids could influence the migration behaviour of radionuclides in geological formations. This is being achieved firstly, by identifying the retention mechanisms of colloids and pseudocolloids (association of radionuclides with colloids) on mineral surfaces by static and dynamic experiments, and secondly by investigating the formation of pseudocolloids. Moreover, these studies will be focused on model systems (surfaces, colloids) selected from studies carried out on the El Berrocal site (characterization of the granite, of the colloids). Two types of experiments are planned: for the study of pseudocolloid formation, sorption experiments (batch tests) with radionuclides will be conducted either with model inorganic colloidal suspensions or with mineral monoliths as macroscopic surfaces of colloids. Dynamic experiments will be performed using well-defined packings of both synthetic and natural minerals (major constituents of granite). Moreover, a particular attention will be devoted to the organic coatings (in static and dynamic conditions). These studies will provide data directly usable by migration models to predict colloid transport under conditions relevant to geological disposals. This programme will be carried out in collaboration with the different partners of this contract: CEA (Fontenay-aux-Roses/F), CIEMAT (Madrid/S), CNRS (Orsay/F), GERMETRAD (Nantes/F), GSF (Munich/G), INFM (Padua/I), INTERA (London/UK) with Dr V. Moulin, Dr P. Rivas, Dr J.C. Dran, Pr Pieri, Dr C. Wolfrum, Pr G. Della Mea and Dr P. Grindrod as project leaders respectively. 4 refs., 2 figs., 1 tab.

1993 (EUR–14690, pp. 63-70) **A model for radionuclide transport by colloids in the geosphere.** Ledoux, E. (Ecole Nationale Superieure des Mines, 77 - Fontainebleau (France). Centre d'Information Geologique). Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

This research project finds its place in the framework of the coordinated RADWAS-program and is found under the contract F12W-CT91-0079 of the Commission of European Communities. Five partners are involved in the project: Ecole des Mines de Paris/ARMINES (E. Ledoux, J. van der Lee); INTAKTA (M.D. de Cayeux); Rijksinstituut voor Volksgezondheid en Milieuhygiene (R. van der Weerd); CNRS-Laboratoire des Sciences du Genie Chimique (J. Dodds, M. Sardin, E. Rodier); ENRESA-CIEMAT (J. Astudillo, A. Hernandez). The main objective of the project is the development of a mathematical model for the migration of colloids and associated radionuclides in groundwaters through geological media. Laboratory migration experiments support the model development and will be used to test the validity of the computer codes. Furthermore, the model must be able to interpret field experiments in order to be applicable as a safety assessment tool for radioactive waste disposals. The project work can be divided into three parts: 1. Theoretical work including a literature survey, formulation of conceptual models, screening of phenomena by means of simple calculations and development of preliminary computer codes. Formulation of the general outline of a final mathematical concept. 2. Migration experiments in laboratory aimed at studying the fundamental transport mechanisms for colloidal substances. Model or artificial colloids are preferable in this stage to achieve fully controlled conditions. Modeling results will stimulate experimental

design. Finally, natural geological media will be used to investigate the applicability of fundamental transport mechanisms to a more realistic environment. 3. Final model development, resulting in an operational tool for column experiments and long term safety assessment. A field data base will be compiled and applied to the model for validation purposes. 3 figs.

1994 (EUR–14690, pp. 79-90) **The CHEMVAL 2 project - status report.** Read, D. (Atkins (W.S.) and Partners, Epsom (United Kingdom)). Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

This paper summarizes the progress made during the first year of CHEMVAL 2, a coordinated four year research programme for evaluating and enhancing chemical models used in radiological risk assessment. Eighteen organisations from nine countries are currently participating, several of whom are also undertaking related experimental studies within the Commission of European Communities (CEC) MIRAGE Project (Migration of Radionuclides in the geosphere) - Third Phase. 16 refs., 3 figs.

1995 (EUR–14690, pp. 93-104) **In situ and laboratory migration experiments through boom clay at Mol.** Preter, P. de (ONDRAF/NIRAS, Brussels (Belgium)); Put, M.; Canniere, P. de. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

Physico-chemical characterization and migration studies in the Boom clay, envisaged as a potential host sediment for high level waste disposal in Belgium, were started some 15 years ago. A synthesis study of this experimental work has recently been conducted to compile all available data. From a comparison of the available migration data and the data requirements as derived from the performance assessment studies PAGIS (1988) and PACOMA (1991) the new migration programme (1991-1995) was defined. The critical radionuclides, both with relation to dose rates to man and to missing or unreliable migration data, turned out to be ^{14}C, ^{99}Tc. ^{135}Cs and ^{237}Np. A second group of radionuclides was found to be possibly critical: ^{79}Se, ^{93}Zr, ^{107}Pd, U^-, Am^-, Cm^-, and Pu-isotopes. This report concentrates on the experimental results as obtained from the migration experiments started in the previous migration programme. Some of the reported radionuclides e.g. ^{90}Sr) have lost their critical character and will not be further studied within the new programme. New experimental data from laboratory tests have become available for Np, Cs, Sr and C (as HCO_3^-) and the first results on the migration of organic molecules dissolved in the interstitial Boom clay water are reported. The hydraulic parameters (the hydraulic conductivity K and the storage coefficient S_o) were calculated from both laboratory percolation experiments and in situ piezometric measurements. Conclusions concerning Boom clay anisotropy are drawn. Finally, a short description of the ongoing in situ HTO injection experiment is given and the experimental data are analyzed and discussed. 10 refs., 4 figs., 1 tab.

1996 (EUR–14690, pp. 105-114) **Rock matrix diffusion as a mechanism for radionuclide retardation: natural radioelement migration in relation to the microfractography and petrophysics of fractured crystalline rock: phase I.** Heath, M.J. (Exeter Univ. (United Kingdom)); Montoto, M. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

Rock matrix diffusion is an important element in radionuclide migration models: diffusion from water-conducting fractures into the rock matrix provides a potentially important mechanism for the retardation of nuclides migrating from a repository. Recent studies of crystalline rocks have shown, however, that free diffusion of nuclides from fractures into the rock matrix does not always take place and that very little of the rock adjacent to fractures may be available for diffusion. Although mathematical models describing diffusion have been developed in the past, they have never been furnished with complete physical and chemical data from actual sites. The aims of the study are: to observe evidence of past diffusion of uranium and its daughters from fractures into the rock adjacent to fractures; to relate observed diffusion phenomena to the physical properties of the rock; to construct physicochemical profiles across fractures and into the adjacent rock to allow complete characterization of past diffusion and assess the potential for future diffusion; and to develop a mathematical diffusion model that can be validated by reference to geological evidence and be incorporated reliably into overall radionuclide migration models. 1 ref., 3 figs.

1997 (EUR–14690, pp. 117-133) **Characterization and validation of natural radionuclide migration processes under real conditions in a fissured granitic environment.** Astudillo, J. (ENRESA, Madrid (Spain)). Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

The general objective of the international El Berrocal Project (Spain) is to understand and model the migration processes controlling the distribution of naturally occurring radionuclides in a fractured granitic environment, using an approach that fully integrates the geochemical, structural and hydrogeological features of the site. The main objectives and activities of the Project consist of a set of five closely inter-related tasks designed: to characterize the geology and hydrogeochemistry of the site at depths up to 200-250 m, to develop and validate a three-dimensional groundwater flow and radionuclide transport model for this shallow zone, and to make predictions of the hydrogeological and hydrochemical system at greater depths with a view toward the planning of Phase 2 investigations. The five tasks include: characterization of the physical environment at the site through surface and borehole studies; characterization of the geochemical environment at the site through hydrogeochemical sampling in boreholes, groundwater colloidal phase sampling, uranium series disequilibrium studies, and chemical characterization of fracture-filling material; radionuclide migration studies, involving analysis of the distribution of natural series radionuclides in the field, laboratory tests of radionuclide mobilization and retardation processes, and in situ migration experiments; characterization of the hydrogeological environment at the site through assessment of borehole conditions, hydraulic testing of local ground-water heads and transmissivities, crosshole interference tests and refinement of groundwater flow models; and modelling of groundwater flow and radionuclide transport at the site, including development and testing of appropriate computer codes, an initial analysis of uncertainties caused by spatial heterogeneity, an initial analysis of flow and transport in a single fracture zone, and development of a conceptual model(s) for the El Berrocal site.

1998 (EUR–14690, pp. 135-142) **Oklo - natural analogue for transfer processes in a geological repository: present status of the programme.** Chapuis, A.M. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire); Blanc, P.L. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204265–: Migration of radionuclides in the geosphere meeting, Brussels (Belgium), 9-10 Apr 1992). In *Migration of radionuclides in the geosphere.* 183p. Order Number DE94604138. Source: OSTI; NTIS (US Sales Only); INIS.

The uranium ore body in Oklo is a unique subject in the world, as natural fission reactions occurred there two billion years ago. It provides opportunities for the study of natural analogy with deep radioactive waste disposal, specially radionuclide mass transfer processes to the surface. The ongoing program is co-funded by the CEC, and it involves several directorates in the CEA, that is to say the IPSN, plus DTA and DCC. Other, non-CEC agencies also take part in the studies, such as SKB (Sweden), AECL and ONTARIO-HYDRO (Canada). It can be subdivided into several different tasks: 1. In situ sampling, in close collaboration with the mining company (C.O.M.U.F., Compagnie des Mines d'Uranium de

Franceville, Mounana, Gabon). 2. Study and characterization of the source term (mostly in CEA laboratories). 3. Studies on the geochemical systems ruling the migrations, implying collaboration between CEA laboratories and other institutions: CREGU (Centre de Recherches sur la Geologie des matieres premieres minerales et energetiques, formerly 'de l'Uranium', Nancy), Centre de Geochimie de la surface (CNRS, Strasbourg), and Ecole Nationale Superieure des Mines de Paris (ENSMP, Centre de Geologie Generale et Miniere and Centre d'Informatique Geologique, Fontainebleau). 4. Modelling: Part of the modelling will take place in each laboratory involved, but the final coupling of models will be the responsibility of IPSN and ENSMP. 1 fig.

1999 (FNAL-TM–1851) **Groundwater migration of radionuclides at Fermilab.** Malensek, A.J.; Wehmann, A.A.; Elwyn, A.J.; Moss, K.J.; Kesich, P.M. Fermi National Accelerator Lab., Batavia, IL (United States). 20 Sep 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94002433. Source: OSTI; NTIS; INIS; GPO Dep.

The simple Single Resident Well (SRW) Model has been used to calculate groundwater movement since Fermilab's inception. A new Concentration Model is proposed which is more realistic and takes advantage of computer modeling that has been developed for the siting of landfills. Site geologic and hydrologic data were given to a consultant who made the migration calculations from an initial concentration that was based upon the existing knowledge of the radioactivity leached out of the soil. The various components of the new Model are discussed, and numerical examples are given and compared with DOE/EPA limits.

2000 (GTK-TUTK–98) **Uranium and radon in wells drilled into bedrock in Southern Finland.** Juntunen, R. Geological Survey of Finland, Espoo (Finland). 1991. 33p. (In Finnish). Order Number DE94605451. Source: OSTI; NTIS; INIS.

More than 1000 samples of groundwater were taken from drilled wells in Southern Finland in 1982-1986 and submitted to chemical analyses that included the determination of uranium and radon abundances in the water. The waters were divided into eight groups by dominant rock type to establish the influence of the geological environment of the water. The median radon abundance for the total data on the drilled wells in southern Finland was 210 Bq/l, and that of uranium 5 ppb. The maximum uranium abundance was 20 000 ppb and that of radon about 50 000 Bq/l.

2001 (GTK-YST–82) **The Palmottu analogue project: Progress Report 1992.** Ahonen, L. (Geological Survey of Finland, Espoo (Finland)); Blomqvist, R.; Suksi, J. Geological Survey of Finland, Espoo (Finland). 1993. 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

The report gives a summary of the results of investigations carried out in 1992 at the Palmottu natural analogue study site, which is a small U-Th mineralization in Nummi-Pusula, southwestern Finland. Additionally, the report includes several separate articles dealing with various aspects of the Palmottu Analogue Project: (1) deep groundwater flow, (2) interpretation of hydraulic connections, (3) characterization of groundwater colloids, (4) uranium mineral-groundwater equilibrium, (5) water-rock interaction and (6) modelling of in situ matrix diffusion. The Palmottu Analogue Project aims at a more profound understanding of radionuclide transport processes in fractured crystalline bedrock. The essential factors controlling transport are groundwater flow and interaction between water and rock. Accordingly, the study includes (1) structural interpretations partly based on geophysical measurements, (2) hydrological studies including hydraulic drill-hole measurements, (3) flow modelling, (4) hydrogeochemical characterization of groundwater, uranium chemistry and colloid chemistry, (5) mineralogical studies, (6) geochemical interpretation and modelling, (7) studies of radionuclide mobilization and retardation including matrix diffusion, and (8) modelling of uranium series data. Palaeohydrogeological aspects, due to the anticipated future glaciation of the Fennoscandian Shield, are of special interest. Quaternary sediments are studied to gain information on post-glacial migration in the overburden. (orig.).

2002 (GTK-YST–82, pp. 7-21) **The Palmottu analogue project: Overview in 1992.** Blomqvist, R. (Geological Survey of Finland, Espoo (Finland)); Ahonen, L.; Suksi, J.; Niini, H. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

This article gives a summary of the studies carried out within the Palmottu Natural Analogue Project in 1992. It consists of (1) an introductionary part describing why an analogue study of the crystalline bedrock of the Fennoscandian Shield is necessary, and outlining the strategy adopted for the project, followed by (2) a geological description of the site, and (3) up-to-date summary of the results of the project. (orig.).

2003 (GTK-YST–82, pp. 65-77) **Uranium mineral - groundwater equilibrium at the Palmottu natural analogue study site, Finland.** Ahonen, L. (Geological Survey of Finland, Espoo (Finland)); Ruskeeniemi, T.; Blomqvist, R.; Ervanne, H.; Jaakkola, T. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

The redox-potential, pH, chemical composition of fracture waters, and uraninite alteration associated with the Palmottu uranium mineralization (a natural analogue study site for radioactive waste disposal in southwestern Finland), have been studied. The data have been interpreted by means of thermodynamic calculations. The results indicate equilibrium between uraninite, ferric hydroxide and groundwater in the bedrock of the study site. Partially oxidized uraninite (UO_2.33) and ferric hydroxide are in equilibrium with fresh, slightly acidic and oxidized water type, while primary uraninite is stable with deeper waters that have a higher pH and lower Eh. Measured Eh-pH values of groundwater cluster within a relatively narrow range indicating buffering by heterogenous redox-processes. A good consistency between measured Eh and analyzed uranium oxidation states was observed.

2004 (GTK-YST–82, pp. 87-98) **Modelling in-situ matrix diffusion at Palmottu.** Rasilainen, K. (Technical Research Centre of Finland, Espoo (Finland). Nuclear Engineering Lab.); Suksi, J. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

Radioactive disequilibria, between U-238, U-234 and Th-230, in crystalline rock adjacent to a fracture, indicates mass transfer of U and Th between water in the fracture and the rock. The matrix diffusion theory was used to interpret the observed profiles of mobilized nuclides around the natural fracture. The interpretation of the profiles was based on the use of uranium series disequilibrium code, URSE, and migration code FTRANS. The model system was characterized using available sitespecific data, and the system evolution was outlined using the geology of the Palmottu site (a natural analogue for radioactive waste disposal). The simulated concentration profiles, as a function of depth from the fracture surface, indicate that measured profiles can be modelled by matrix diffusion, assuming realistic initial and boundary conditions and diffusion times of 300,000 years.

2005 (IAEA-TECDOC–713) **Nuclear techniques in the study of pollutant transport in the environment. Interaction of solutes with geological media (methodological aspects): Final report of a co-ordinated research programme, 1987-1992.** International Atomic Energy Agency, Vienna (Austria). Jul 1993. 343p. Order Number DE94602763. Source: OSTI; NTIS (US Sales Only); INIS.

This volume includes a summary of the 5-year co-ordinated research programme to use nuclear techniques for the study of the transport of pollutants (both radioactive and non-radioactive) in the environment as well as twelve individual reports of the different activities performed under the programme. These have been indexed separately. Refs, figs and tabs.

2006 (INIS-BR–3173) **Determination of soil parameters during the water horizontal infiltration and redistribution by**

gamma ray attenuation method and tensiometry. Oliveira, J.C.M. de. Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil). Apr 1991. 94p. (In Portuguese). Order Number DE94604289. Source: OSTI; NTIS (US Sales Only); INIS.

The present work studies the water diffusivity and hydraulic conductivity in a Latossolo Roxo distrofico soil, during the water infiltration and redistribution processes. Variation water flow equations were utilized for the calculations. The data of wetting front positions and of soil water content profiles were obtained through the gamma ray attenuation from a 241-Am source, with 100 mCi activity detected by a standard electronic equipment of gamma spectrometry, with NaI CTD scintillation detector. From the soil water content data in function of space and time and from analytic models, the properties of soil water diffusivity and soil hydraulic conductivity were determined in the laboratory for the 0-10 cm and 10-25 soil layers. (author).

2007 (INIS-BR–3175) **Evaluation of natural environmental radiation levels from gamma field spectrometry.** Paschalati, E.M. (Universidade Estadual de Campinas, SP (Brazil). Inst. de Geologia); Amaral, G. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604284. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NATURAL RADIOACTIVITY/dose equivalents; NATURAL RADIOACTIVITY/gamma spectroscopy; BACKGROUND RADIATION; BRAZIL; COSMIC RADIATION; GAMMA RADIATION; HUMAN FACTORS; NAI DETECTORS; POTASSIUM; RADIATION DOSES; RADIATION MONITORING; THORIUM; URANIUM; WHOLE-BODY IRRADIATION

2008 (INIS-BR–3176) **Detection of hydrothermal change zone by TM images analysis and spectroradiometric measures.** Ferreira, L.G. (Brasilia Univ., DF (Brazil)); Meneses, P.R.; Jost, H. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604290. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/metamorphism; MINERALS/radiometric surveys; MINERALS/spectra; BRAZIL; IMAGE PROCESSING; IMAGES; MINERALIZATION; MINERALS; METAMORPHISM; SPECTRA; PETROLOGY; PROSPECTING

2009 (INIS-BR–3183) **Analysis of cryolite mineral content by nuclear exploration technique.** Jayanthi, U.B. (Instituto de Pesquisas Espaciais (INPE), Sao Jose dos Campos, SP (Brazil)); Goncalez, O.L.; Rigolon, L.S.Y.; Jayanthi, K.A.; Figueiredo, A.M.G.; Garg, V.K. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604291. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/fluorine; MINERALS/neutron activation analysis; ALUMINIUM; GAMMA SOURCES; GEOCHEMISTRY; MEV RANGE 01-10; MINERALS; FLUORINE; NAI DETECTORS; NEUTRON REACTIONS; QUANTITATIVE CHEMICAL ANALYSIS; SODIUM; WELL LOGGING

2010 (INIS-BR–3185) **Determination of U, Th and K concentration and the heat production rate in samples of trough from a well drilling in metasediments from Bambui Group.** Roque, A. (Sao Paulo Univ., SP (Brazil). Inst. Astronomico e Geofisico); Ribeiro, F.B.; Hiodo, F.Y. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 3p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604285. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POTASSIUM/gamma spectroscopy; POTASSIUM/sediments; THORIUM/gamma spectroscopy; THORIUM/sediments; URANIUM/gamma spectroscopy; URANIUM/sediments; BRAZIL; COMPARATIVE EVALUATIONS; GAMMA LOGGING; GEOTHERMAL ENERGY; HEAT FLUX; PETROLOGY; POTASSIUM; SEDIMENTS; THORIUM; URANIUM; WELL DRILLING

2011 (INIS-BR–3186) **Intrusive suite from Itu: comparison between data from aerial and terrestrial gamma spectrometry.** Ferreira, F.J. (Parana Univ., Curitiba, PR (Brazil). Dept. de Geologia); Pascholati, E.M. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604292. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/gamma spectroscopy; BRAZIL; COMPARATIVE EVALUATIONS; GEOLOGIC SURVEYS; GRANITES; MAPS; NAI DETECTORS; NUMERICAL DATA; POTASSIUM; THORIUM; URANIUM

2012 (INIS-BR–3201) **Semi-quantitative evaluation of tin in alluvial deposits based in gamma spectrometry.** Pascholati, E.M. (Universidade Estadual de Campinas, SP (Brazil). Inst. de Geociencias); Amaral, G.; Pascholati, P.R.; Morais Filho, A.F.C.; Shimada, H. Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94605473. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALLUVIAL DEPOSITS/chemical analysis; TIN/gamma spectroscopy; EVALUATION; HIGH-PURITY GE DETECTORS; MINERALS; THORIUM; TIN; URANIUM

2013 (INIS-mf–13731, pp. 18) **Usefulness of radon measurements in earth sciences.** Khan, H.A. (SSNTD-Lab. (NED), PINSTECH, Islamabad, Pakistan). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GEOLOGY/radon; RADON/radiation detection; DIELECTRIC TRACK DETECTORS; EARTHQUAKES; GEOLOGY; RADON; SHOCK WAVES; USES; VOLCANOES

2014 (INIS-mf–13731, pp. 19) **A comprehensive approach of radon measurements for geophysical studies.** Monnin, M. (Lab. d'Hydrogeologie - Centre National de la Recherche Scientifique - Univ. Montpellier II (France)); Morin, J-P.; Seidel, J-L. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/geophysical surveys; RADON/radiations; RADIONUCLIDE MIGRATION; RADON; RADIATIONS

2015 (INIS-mf–13731, pp. 33) **Radon and earthquake prediction: present status and future trends.** Virk, H.S. (Guru Nanak Dev Univ., Amritsar (India). Dept. of Physics). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EARTHQUAKES/forecasting; RADON/radiation monitoring; ALPHA DETECTION; EARTHQUAKES; FORECASTING; EMANOMETERS; RADON

2016 (INIS-mf–13731, pp. 35) **Radon Monitoring in soils and water.** Surbeck, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/radiation monitoring; SOILS/radon; WATER/radon; RADIONUCLIDE MIGRATION; RADON; SOILS; WATER

2017 (INIS-mf–13731, pp. 63) **Radon monitoring related to a subduction zone in Mexico.** Segovia, N. (ININ, Mexico, D.F. (Mexico)); Tamez, E.; Mena, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing

(China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EARTHQUAKES/radiation monitoring; RADON/radiation monitoring; DIELECTRIC TRACK DETECTORS; EARTHQUAKES; EMANATION METHOD; MEXICO; RADON; SOILS

2018 (INIS-mf–13731, pp. 65) **Experiences with radon measurements for earthquake prediction and landslides.** Heinicke, J. (Saxon Academy of Sciences at Leipzig (Germany)); Koch, U. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EARTHQUAKES/forecasting; LANDSLIDES/forecasting; RADON/radiation detection; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; EARTHQUAKES; FORECASTING; LANDSLIDES; RADON

2019 (INIS-mf–13731, pp. 67) **Continuous measurements of radon content in groundwater on the volcanic site of 'Piton de la Fournaise' (Island of Reunion, France).** Barillon, R. (Laboratoire de Microanalyses Nucleares, Univ. de Franche Comte, Besancon (France)); Chambaudet, A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. VOLCANIC REGIONS/radon; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; FRANCE; GROUND WATER; RADIATION MONITORING; RADON

2020 (INIS-mf–13731, pp. 68) **Hydrogeology studies using SSNTD and electronic detectors.** Seidel, J-L. (Lab. d'Hydrogeologie - Centre National de la Recherche Scientifique - Univ. Montpellier II (France)); Morin, J-P.; Monnin, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GEOLOGY/dielectric track detectors; GEOLOGY/electron probes; HYDROLOGY/dielectric track detectors; HYDROLOGY/electron probes; GEOLOGY; HYDROLOGY; RADIOMETRIC SURVEYS; RADON

2021 (INIS-mf–13731, pp. 69) **Comparison of a new approach for the study of thermal history of minerals with more standard semi-empirical procedures.** Chambaudet, A. (Universite de Franche-comte, Besancon (France)); Miellou, J.C.; Igli, H.; Rebetez, M.; Grivet, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MINERALS/temperature measurement; COMPARATIVE EVALUATIONS; HISTORICAL ASPECTS; MEASURING METHODS; MINERALS; PARTICLE TRACKS; ROCKS

2022 (INIS-mf–13731, pp. 70) **The study of nuclear tracks in crystals.** Perelygin, V.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CRYSTALS/particle tracks; ANNEALING; BACKGROUND RADIATION; CRYSTALS; EARTH PLANET; EFFICIENCY; GALAXY NUCLEI; SENSITIVITY; STABILITY; URANIUM

2023 (INIS-mf–13731, pp. 71) **Recent progress on apatite fission track analysis and its application in China.** Wang Shicheng (Academia Sinica, Beijing, BJ (China). Inst. of High Energy Physics); Kang Tiesheng; Jing Guiru. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/fission tracks; AGE ESTIMATION; APATITES; CALIBRATION; CHINA; MEASURING METHODS; USES

2024 (INIS-mf–13731, pp. 84) **Electron microscopy analysis of krypton ion tracks induced in Durango apatite.** Grivet, M. (Laboratoire de Microanalyses Nucleares, Univ. de Franche Comte, Besancon (France)); Rebetez, M.; Chambaudet, A.; Ben Ghouma, N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/particle tracks; PARTICLE TRACKS/electron microscopy; PARTICLE TRACKS/krypton 86; ANNEALING; APATITES; ETCHING; FISSION FRAGMENTS; GANIL CYCLOTRON; KRYPTON IONS; MEXICO; URANIUM 238

2025 (INIS-mf–13731, pp. 87) **Radon measurement in seismological research.** Yang Yurong (Center for Analysis and Prediction, SSB (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOILS/radon; CONCENTRATION RATIO; GROUND WATER; SEISMOLOGY; SOILS; RADON

2026 (INIS-mf–13731, pp. 88) **Use of SSNTD to study environgeology of carcinogen in Gejiu area.** Lu Wei (Tianjin Inst. of Geology and Mineral Resources, Chinese Academy of Geological Science (China)); Wang Zhengting; Chen Ming. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORES/radon; RADON/activity levels; RADON/dielectric track detectors; ROCKS/radon; CARCINOMAS; CHINA; LUNGS; ORES; RADON; ROCKS; SEASONAL VARIATIONS

2027 (INIS-mf–13731, pp. 89) **Determination of the scale of variation in radon soil gas concentrations using the method of nested sampling.** Badr, I. (Birmingham Univ. (United Kingdom)); Durrani, S.A.; Hendry, G.L.; Oliver, M.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/activity levels; RADON/sampling; SOILS/radon; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; RADON; SAMPLING; SOILS

2028 (INIS-mf–13731, pp. 124) **Landslide prediction by soil radon monitoring.** Mahat, R.H. (Physics Dept., Univ. of Malaya, Kuala Lumpur (Morocco)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LANDSLIDES/forecasting; RADON/radiation monitoring; DOSEMETERS; LANDSLIDES; FORECASTING; RADON; SOILS

2029 (INIS-mf–13731, pp. 130) **Measurement of radon from building materials in Ghana.** Andam, A.A.B. (Nuclear Research Lab., Dept. of Physics, Univ. of Science and Technology, Kumasi (Ghana)); Amoo, D.N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BUILDING MATERIALS/ghana; BUILDING MATERIALS/radon; GHANA; RADON; CEMENTS; CONCRETES; NATURAL RADIOACTIVITY

2030 (INIS-mf–13731, pp. 131) **Use of CR-39 as radon and radon daughters detectors for indoor measurements in a mill, in Adana.** Uenlue, G. (Cukurova Univ., Art Sciences Faculty, Physics Dept. (Turkey)); Yegingil, Z. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/dielectric track detectors; RADON/industrial plants; ACTIVITY LEVELS; CONCENTRATION RATIO; DAUGHTER PRODUCTS; EXPERIMENTAL DATA; RADON; SOILS; TURKEY

2031 (INIS-mf–13731, pp. 157) **Fission tracks annealing and the thermal history of Yugoslavian chondrites.** Jovanovic, L. (Naturhistorische Museum, Wien (Australia)); Kurat, G.; Kostic, A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHONDRITES/fission tracks; CHONDRITES/yugoslavia; ANNEALING; CHONDRITES; YUGOSLAVIA; TEMPERATURE DEPENDENCE

2032 (INIS-mf–13731, pp. 160-161) **The use of radiographic techniques for studying elemental distributions in natural and technological objects.** Flitsiyan, E.S. (Inst. of Nuclear Physics, Uzbek Academy of Sciences, Ulugbek (Uzbekistan)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELEMENTS/distribution; MICRORADIOGRAPHY/uses; ELEMENTS; DISTRIBUTION; GEOCHEMICAL SURVEYS; GEOLOGY; IONIZATION; MICRORADIOGRAPHY; USES

2033 (INIS-mf–13731, pp. 165) **The application of the ARG- and SSNTD-methods in the geochemical investigation of gold and uranium.** Mironov, A.G. (Buryat Geological Inst., Ulan Ude (China)); Zhmodik, S.M.; Nimaev, Y.N.; Ochirov, Y.C. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/geochemistry; DIELECTRIC TRACK DETECTORS/geochemistry; AUTORADIOGRAPHY; GEOCHEMISTRY; GOLD; URANIUM

2034 (INIS-mf–13731, pp. 166) **Fission track determination of uranium and thorium in zirconium, thorium and uranium ores.** Carvalho, M.L.C.P. (Analytical Chemistry Dept., Federal Univ. (Brazil)); Medeiros, J.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/thorium; FISSION TRACKS/uranium; CONCENTRATION RATIO; THORIUM; URANIUM; IRRADIATION; PILE NEUTRONS; THORITE; URANIUM ORES; ZIRCON

2035 (INIS-mf–13731, pp. 170) **Effect of radiation damage on thermoluminescence and infra-red properties of natural apatites.** Nor, A.F.MD. (Thermoluminescence and Nuclear Tracks Lab., Dept. of Physics, Univ. of Malaya, Kuala Lumpur (Malaysia)); Amin, Y.M.; Mahat, R.; Kamaluddin, B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/infrared spectra; APATITES/thermoluminescence; ANNEALING; APATITES; THERMOLUMINESCENCE; PERFORMANCE; PHYSICAL RADIATION EFFECTS; SENSITIVITY; TEMPERATURE DEPENDENCE

2036 (INIS-mf–13731, pp. 171) **Growth rates of the ferro manganese nodules obtained by the cellulose nitrate detector LR-115.** Vlasova, I.E. (P.P. Shirshov Inst. of Oceanology, Russian Academy of Sciences, Moscow (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/iron ores; DIELECTRIC TRACK DETECTORS/manganese ores; ALPHA DETECTION; CELLULOSE; IMAGES; NITRATES; PARTICLE TRACKS

2037 (INIS-mf–13731, pp. 174) **Use of alpha sensitive plastic film (ASPF) technique to locate the re-mobilized uranium ore bodies in sandstones.** Qureshi, A.A. (SSNTD-Lab. (NED), PINSTECH, Islamabad (Pakistan)); Khan, H.A.; Beg, M.A.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM ORES/alpha detection; URANIUM ORES/organic polymers; FILMS; GEOLOGIC DEPOSITS; SANDSTONES; SENSITIVITY

2038 (INIS-mf–13731, pp. 175) **Radon diffusion studies in water, soil, air, concrete and sand.** Singh, B. (Physics Dept., Guru Nanak Dev Univ. Amritsar (India)); Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/diffusion; AIR; CONCRETES; RADON; DIFFUSION; SAND; SOILS; WATER

2039 (INIS-mf–13731, pp. 182) **Investigation of radon in subsurface soil and water as an earthquake precursor.** Singh, M. (Physics Dept., Guru Nanak Dev Univ. (India)); Singh, S.; Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EARTHQUAKES/forecasting; RADON/ground water; RADON/soils; EARTHQUAKES; FORECASTING; INDIA; RADON; SOILS

2040 (INIS-mf–13731, pp. 185) **Characterisation of soil parameters for radon assessment in human environments.** Singh, N.P. (Longowal Inst. of engineering and Technology (India)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on

nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/radionuclide migration; RADON/soils; ENVIRONMENT; HUMIDITY; PERMEABILITY; RADON; SOILS; TEMPERATURE DEPENDENCE

2041 (INIS-mf–13731, pp. 237) **Nuclear tracks in natural and synthetic gemstones.** Espinosa, G. (Instituto De Fisica, Mexico, D.F. (Mexico)); Rodriguez-L., V.; Golzarri, J.I.; Castano, V.M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/minerals; ALPHA PARTICLES; CRYSTALS; DIELECTRIC TRACK DETECTORS; ETCHING; FISSION FRAGMENTS; MINERALS

2042 (INIS-mf–13731, pp. 242) **Influence of the apatite F/Cl ratio on the uranium fission tracks.** Ghouma, N.B. (Laboratoire de Microanalyses Nucleaires, Faculte des Sciences, Besancon (France)); Rebetez, M.; Grivet, M.; Chambaudet, A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. APATITES/chlorine; APATITES/fluorine; URANIUM/apatites; URANIUM/fission tracks; APATITES; CHLORINE; FLUORINE; CHEMICAL COMPOSITION; CONCENTRATION RATIO; URANIUM

2043 (INIS-mf–13731, pp. 304) **On determination of bismuth concentration in specimens by alpha-activation technique.** Perelygin, V.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Stetsenko, S.G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH ORES/activation analysis; ALPHA DETECTION; BISMUTH 209; CONCENTRATION RATIO; DEUTERON REACTIONS; DIELECTRIC TRACK DETECTORS; POLONIUM; SENSITIVITY

2044 (INIS-mf–13731, pp. 305) **Studying uranium distribution in minerals of carbonatite from northwest Pakistan using fission track analysis.** Mateen, A. (Center for Nuclear Studies, Islamabad (Pakistan)); Ahmed, A.; Qureshi, A.A.; Khan, H.A.; Rauf, A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM/carbonate minerals; URANIUM/distribution; DISPERSIONS; FISSION TRACKS; PAKISTAN; TEXTURE; URANIUM; DISTRIBUTION

2045 (INIS-mf–13731, pp. 308) **Ending time of intensive geologic alternating action (IGAA) in Taowan group of Qinling mountains.** Lu Zuhui (Fundamental and Applied Sicence Research Institute of Henan Zhengzhou Univ., Zhengzhou (China)); Xu Aijun; Chen Dongrong; Wang Yujin; Gou Shilun; Hao Xiouhong; Guan Baode; Tao Zijiang. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/mountains; MOUNTAINS/dielectric track detectors; MOUNTAINS/geologic structures; MOUNTAINS; CHINA; FISSION TRACKS; MICA; PHOSPHATE ROCKS

2046 (INIS-mf–13731, pp. 311) **Thermal and tectonic history of two basins in north China.** Wang Shicheng (Inst. of High Energy Physics, Acadimia Sinica, Beijing (China)); Kang Tiesheng; Feng Shi; Zhou Licheng. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GEOTHERMAL ENERGY/fission tracks; TECTONICS/fission tracks; AGE ESTIMATION; APATITES; CHINA; GEOLOGIC HISTORY; GEOLOGIC STRUCTURES; TECTONICS

2047 (INIS-mf–13731, pp. 312) **The thermal evolution histories of the collision zone in Zhejiang-Fujian provinces of China from fission track analysis.** Kang Tiesheng (Inst. of High Energy Physics, Academia Sinica, Beijing (China)); Wang Shicheng; Wang Yihua. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GEOLOGIC HISTORY/fission tracks; AGE ESTIMATION; APATITES; CHINA; GEOTHERMAL ENERGY; ZIRCON

2048 (INIS-mf–13731, pp. 320) **Determination of the environmental radioactive contamination by using plant radiography.** Bersina, I.G. (Institute of Railways Transport, Moscow (Russian Federation)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIOACTIVE EFFLUENTS/biological indicators; CONTAMINATION; DISTRIBUTION; DUSTS; LEAVES; PLANTS; ROOTS; RADIOECOLOGY

2049 (INIS-mf–13731, pp. 322) **Estimation of uranium and thorium using nuclear track techniques.** Bajwa, B.S. (Dept. of Physics, Guru Nanak Dev Univ. (India)); Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THORIUM/dielectric track detectors; THORIUM/fossils; URANIUM/dielectric track detectors; URANIUM/fossils; ALPHA PARTICLES; AUTORADIOGRAPHY; FISSION TRACKS; THORIUM; FOSSILS; URANIUM

2050 (INIS-mf–13731, pp. 323) **Nondestructive control of Chernobyl hot particles behavior and migration of radionuclides in soil-plant system.** Victorova, N.V. (Hydrometeorological Inst., Kiev (Ukraine)); Demchuk, V.V.; Ganga, E.V.; Chuiko, N.A.; Tretyakova, S.P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOILS/radionuclide migration; CHERNOBYLSK-4 REACTOR; DIELECTRIC TRACK DETECTORS; NONDESTRUCTIVE TESTING; PARTICLES; PLANTS; SOILS

2051 (INIS-mf–13731, pp. 325) **On the determination of low Pu content in environment.** Perelygin, V.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Chuburkov, Yu.T. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ENVIRONMENT/plutonium; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; ENVIRONMENT; PLUTONIUM; IBR-2 REACTOR; IRRADIATION; SENSITIVITY; SEPARATION PROCESSES; SOILS

2052 (INIS-mf–13731, pp. 327) **Application of autoradiography to sorption studies.** Liu Yonglian, Zheng Wenji (China Inst. of Atomic Energy (China)); Hu Xiuhau. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AUTORADIOGRAPHY/adsorption; AUTORADIOGRAPHY/uses; AMERICIUM 241; AUTORADIOGRAPHY; ADSORPTION; USES; IODINE 125; NUCLEAR EMULSIONS; PLUTONIUM 239; ROCKS; TECHNETIUM 99

2053 (INIS-mf–13731, pp. 345) **Radon diffusion studies through hydrocarbons.** Singh, M. (Dept. of Physics, Guru Nanak Dev Univ. (India)); Singh, S.; Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/diffusion; RADON/hydrocarbons; ACTIVITY LEVELS; DIELECTRIC TRACK DETECTORS; DIFFUSION LENGTH; RADON; DIFFUSION; HYDROCARBONS; WATER

2054 (INIS-mf–13731, pp. 346) **Earthquake prediction studies in Kangra valley using plastic track recorders.** Singh, B. (Physics Dept., Guru Nank Dev Univ. (India)); Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EARTHQUAKES/forecasting; RADON/dielectric track detectors; EARTHQUAKES; FORECASTING; EMANATION METHOD; METEOROLOGY; RADON

2055 (INIS-mf–13731, pp. 351) **Recommendations for the setting up of a radon in soil network based upon a decennial study.** Segovia, N. (Instituto Nacional de Investigaciones Nucleares, Mexico, D.F. (Mexico)); Tamez, E.; Morin, J.P.; Monnin, M.; Seidel, J-L. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/radiation monitoring; RADON/soils; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; MEXICO; RADON; SOILS; RECOMMENDATIONS; SEASONAL VARIATIONS

2056 (INIS-mf–13731, pp. 353) **A tri-dimensional model for radon transport in a porous.** Morin, J.P. (Lab. d'Hydrogeologie, Centre National de la Recherche Scientifique Univ. Montpellier II, Montpellier (France)); Seidel, J-L.; Monnin, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIONUCLIDE MIGRATION/three-dimensional calculations; RADON/porous materials; RADON/radionuclide migration; EQUATIONS; GEOLOGIC STRUCTURES; RADON; SIMULATION

2057 (INIS-mf–13731, pp. 363) **Radon distribution measurement of LUGO coal mine by CSR technique.** Sun Zhongtian (Physics Dept., Zhengzhou Univ. (China)); Pan Xianjia; Hu Guoju. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/mines; RADON/spatial distribution; ALPHA PARTICLES; COAL; EXPERIMENTAL DATA; PARTICLE TRACKS; RADON; MINES

2058 (IR-CR–93075) **Preliminary assessment report for Redmond Army National Guard Facility, Installation 53120, Redmond, Washington: Installation Restoration Program.** Ketels, P.; Aggarwal, P. Argonne National Lab., IL (United States). Aug 1993. 37p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000434. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Washington Army National Guard (WAARNG) property in Redmond, Washington. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Redmond ARNG property, Phase I of the Department of Defense Installation Restoration Program. The environmentally significant operations (ESOs) associated with the property are (1) supply/storage of hazardous materials, (2) weapons cleaning, (3) the underground storage tanks (USTs), and (4) the use of herbicides. These ESOs are no longer active because of the closure of OMS 10 activities in 1988.

2059 (IR-CR–93076) **Preliminary assessment report for Bee Caves Armory (former Nike BG-80 Fire Control Facility), Installation 48055, Austin, Texas: Installation Restoration Program.** Dennis, C. Argonne National Lab., IL (United States). Aug 1993. 67p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040730. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Texas Army National Guard (ARNG) property in Austin, Texas. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing, preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining, site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Bee Caves Armory property, the requirements of the Department of Defense Installation Restoration Program. Of concern is the potential for hazardous waste to be present on the property as a result of the former Nike Missile Base operations or in the form of original construction materials. Environmentally sensitive operations associated with the property from that period include (1) underground fuel storage, (2) hazardous materials storage/use, (3) disposal of hazardous waste and (4) release of hazardous waste water.

2060 (IR-CR–93077) **Preliminary assessment report for Army Aviation Support Facility 2, Installation 25075, Westover Air Force Base, Chicopee, Massachusetts: Installation Restoration Program.** Haffenden, R.; Flaim, S. Argonne National Lab., IL (United States). Aug 1993. 37p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000501. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Massachusetts Army National Guard (MAARNG) property known as the Army Aviation Support Facility 2 (AASF 2) near Chicopee, Massachusetts. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective

actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. The AASF 2 is a 10-acre site located in the western portion of Massachusetts, in the town of Chicopee, in the county of Hampden. The facilities included in this PA are Building 7400, adjacent paved areas, grassy areas, and the hazardous waste drum storage buildings. The environmentally significant operations (ESOS) associated with the property are (1) the waste drum storage area, (2) abandoned underground storage tanks (USTs), and (3) refueling activities.

2061 (IR-CR–93078) **Preliminary assessment report for National Guard Facility, Installation 25255, Rehoboth, Massachusetts: Installation Restoration Program.** Haffenden, R.; Flaim, S.; Krokosz, M. Argonne National Lab., IL (United States). Aug 1993. 40p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000530. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Massachusetts Army National Guard (MAARNG) property known as the Rehoboth National Guard Facility (RNGF) in Rehoboth, Massachusetts. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for ftirther action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the RNGF property, phase I of the Department of Defense Installation Restoration Program (IRP). The scope of this assessment is limited to the facilities under the control of the MAARNG and the past activities contained within that area.

2062 (IR-CR–93079) **Preliminary assessment report for Waiawa Gulch, Installation 15080, Pearl City, Oahu, Hawaii: Installation Restoration Program.** Argonne National Lab., IL (United States). Aug 1993. 49p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000522. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Hawaii Army National Guard (HIARNG) property near Pearl City, Oahu, Hawaii. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Waiawa Gulch property, phase I of the Department of Defense Installation Restoration Program (IRP).

2063 (IR-CR–93080) **Preliminary assessment report for Camp Swift Military Reservation, Installation 48070, Bastrop County, Texas: Installation Restoration Program.** Dennis, C.B. Argonne National Lab., IL (United States). Aug 1993. 61p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000562. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Texas Army National Guard property in Bastrop County, Texas. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Camp Swift property, the requirement of the Department of Defense Installation Restoration Program (IRP). The review of both historical and current practices at the property indicated that the activities at Camp Swift include no operations considered to have an adverse impact to the environment. The recommendation, therefore, is that no further IRP action is necessary at this property.

2064 (IR-CR–93081) **Preliminary assessment report for Wayland Army National Guard Armory (former Boston Defense Area Nike Battery 73), Installation 23295, Wayland, Massachusetts: Installation Restoration Program.** Haffenden, R.; Flaim, S.; Krokosz, M. Argonne National Lab., IL (United States). Aug 1993. 39p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000500. Source: OSTI; NTIS; GPO Dep.

This report presents the results of preliminary assessment (PA) conducted by Argonne National Laboratory at the Massachusetts Army National Guard property near Wayland, Massachusetts. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in respond to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining sites activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Wayland Army National Guard Army property, Phase I of the Department of Defense Installation Restoration Program.

2065 (IR-CR–93082) **Preliminary assessment report for Fort Custer Training Center, Installation 26035, Augusta, Michigan: Installation Restoration Program.** Flaim, S.; Krokosz, M. Argonne National Lab., IL (United States). Aug 1993. 39p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000584. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Michigan Army National Guard property near Augusta, Michigan. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Fort Custer Training Center, phase I of the Department of Defense Installation Restoration Program. The environmentally significant operations associated with the property are (1) storage of hazardous materials and hazardous waste, (2) storage and dispensing of fuel, (3) washing of vehicles and equipment, and (4) weapons training ranges that may have accumulated lead.

2066 (IR-CR–93086) **Preliminary assessment report for Virginia Army National Guard Army Aviation Support Facility, Richmond International Airport, Installation 51230, Sandston, Virginia.** Dennis, C.B. Argonne National Lab., IL (United States). Sep 1993. 63p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000992. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Virginia Army National Guard (VaARNG) property in Sandston, Virginia. The Army Aviation Support Facility (AASF) is contiguous with the Richmond International Airport. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The PA is designed to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. The AASF, originally constructed as an active Air

Force interceptor base, provides maintenance support for VaARNG aircraft. Hazardous materials used and stored at the facility include JP-4 jet fuel, diesel fuel, gasoline, liquid propane gas, heating oil, and motor oil.

2067 (IR-CR–93087) **Preliminary assessment report for Fort Jacob F. Wolters, installation 48555, Mineral Wells, Texas: Installation Restoration Program.** Dennis, C.B. Argonne National Lab., IL (United States). Aug 1993. 67p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001662. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Texas Army National Guard (TXARNG) property near Mineral Wells, Texas. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Fort Wolters property, the requirement of the Department of Defense Installation Restoration Program.

2068 (IR-CR–93088) **Preliminary assessment report for Florence Military Reservation, Installation 04080, Florence, Arizona: Installation Restoration Program.** Argonne National Lab., IL (United States). Aug 1993. 35p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001663. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Arizona Army National Guard property near Florence, Arizona. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. Florence Military Reservation is a 5,655-acre site located in the southern portion of Arizona, about 65 mi southeast of Phoenix, in the county of Pinal. Florence Military Reservation includes Unit Training Equipment Site (UTES) 1, an artillery firing range, and ammunition storage. The subject of this PA is the UTES. The environmentally significant operations associated with the UTES property are (1) vehicle maintenance and refueling, (2) supply/storage of materials, and (3) the vehicle washrack.

2069 (IS–5098) **Ames Laboratory Site Environmental Report, Calendar year 1992.** Ames Lab., IA (United States). [1992]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94000668. Source: OSTI; NTIS; GPO Dep.

The summarized data and conclusions from the Ames Laboratory environmental monitoring program are presented in this Annual Site Environmental Report. Pollution awareness and waste minimization programs and plans implemented in 1990 are continuing to date. Ames Laboratory (AL) is responsible for a small chemical burial site, located on ISU property. The site was used for the disposal of chemical and metal slags from thorium and uranium production. Samples of water from existing test wells, and upstream and downstream sites on the nearby Squaw Creek, have not detected migration of the buried materials off site. Surface, hand auger and deep boring soil samples have been collected from the site. The analytical results are pending, Six new monitoring wells have been installed and sampled. Analytical results are pending. Ames Laboratory is responsible for an area contaminated by diesel fuel that leaked from an underground storage tank (UST) in 1970. The tank was removed that year. Soil borings and groundwater have been analyzed for contamination and a preliminary assessment written. Nine small inactive waste sites have been identified for characterization. The NEPA review for this work resulted in a CX determination. The work plans were approved by AL and CH. A subcontractor has surveyed and sampled the sites. Analytical results are pending.

2070 (IS-M–774) **Chemical gas sensors and the characterization, monitoring and sensor technology needs of the US Department of Energy.** Bastiaans, G.J.; Haas, Wm.J. Jr.; Junk, G.A. Ames Lab., IA (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9309247–3: National Institute of Standards and Technology (NIST) workshop on gas sensors, Gaithersburg, MD (United States), 8-9 Sep 1993). Order Number DE94001805. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Technology Development within the Dept. of Energy (DOE) has the responsibility of providing new technologies to aid the environmental restoration and waste management (ER/WM) activities of the DOE. There is a perception that application and judicious development of chemical sensor technologies could result in large cost savings and reduced risk to the health and safety of ER/WM personnel. A number of potential gas sensor applications which exist within DOE ER/WM operations are described. The capabilities of several chemical sensor technologies and their potential to meet the needs of ER/WM applications in the present or near term future are discussed.

2071 (JAERI-M–93-125) **Environmental radiation data, 9: Background dose rates in and around Tokyo etc. measured with portable instruments (Feb., 1991 - Mar., 1993).** Nagaoka, Toshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sakamoto, Ryuichi; Saito, Kimiaki; Tsutsumi, Masahiro; Moriuchi, Shigeru. Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 46p. (In Japanese). Order Number DE94718959. Source: OSTI; NTIS; INIS.

The Environmental Physics Laboratory has conducted a large number of background radiation surveys in these years, aiming at the analysis of characteristics and behaviour of environmental radiation, the development of measurement techniques and instruments of environmental radiation, and the evaluation of environmental radiation dose. As the environmental radiation data obtained by these surveys are useful for broad purposes as actual survey data, it is desirable to arrange these data systematically and to open them to the other scientist. For that, it is necessary to make the recording media and the FORMAT of these data available for usual computers. In the light of this circumstance, these data were rearranged and recompiled systematically to meet the demand. This report mentions about the data obtained by the background radiation surveys in and around Tokyo performed during 1991 - 1993 using portable instruments, as well as the information necessary for the data handling. (author).

2072 (KCP–613-5171) **Site environmental report for calendar year 1992, Kansas City Plant, Kansas City, Missouri.** Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. May 1993. 204p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94000362. Source: OSTI; NTIS; INIS; GPO Dep.

The Kansas City Plant is a government-owned, contractor-operated facility. AlliedSignal and its predecessors have been the operating contractors since 1949. The principal operation performed at the Kansas City Plant is the manufacture of non-nuclear components for nuclear weapons. This activity involves metals and plastics machining, plastics fabrication, plating, microelectronics, and electrical and mechanical assembly. No radioactive materials are machined or processed. This report presents information and data pertaining to the environmental monitoring program and compliance with environmental standards.

2073 (LA–12650-MS) **Data analysis of the 1984 and 1986 soil sampling programs at Materials Disposal Area T in the Los Alamos National Laboratory.** Nyhan, J.W.; Drennon, B.J. Los Alamos National Lab., NM (United States). Sep 1993. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002499. Source: OSTI; NTIS; INIS; GPO Dep.

An environmental surveillance program for Materials Disposal Area T (MDA-T) at Los Alamos, New Mexico is described. The waste-use history of this disposal site is described, followed by a description of the materials and methods used to analyze data from two surface soil radionuclide sampling programs performed at this disposal site. The disposal site's physical features are related to the spatial distribution of radionuclide concentration contours in an attempt to evaluate radionuclide migration mechanisms in and around the site. The usefulness of the data analysis efforts is evaluated and recommendations are made for future studies.

2074 (LBL–34461) **Radon sources emanation in granitic soil and saprolite.** Wollenberg, H. (Lawrence Berkeley Lab., CA (United States)); Flexser, S.; Brimhall, G.; Lewis, C. Lawrence Berkeley Lab., CA (United States). Aug 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9309191–1: International radon conference, Denver, CO (United States), 20-23 Sep 1993). Order Number DE94001256. Source: OSTI; NTIS; GPO Dep.

Petrological and geochemical examinations of soil, saprolite, and quartz diorite protolith have been made at the Small Structures field site, Ben Lomond Mountain, California. Variations in Ra in soil and saprolite are mainly controlled by heterogeneities inherited from the parent quartz diorite. Fission-track radiography shows that U is concentrated in the primary accessory minerals, zircon and sphene. However, most importantly for Rn emanation, U is also concentrated in secondary sites: weathered sphene, biotite and plagioclase, grain coatings, and Fe-rich fracture linings which also contain a rare-earth phosphate mineral. This occurrence of U along permeable fracture zones suggests that soil-gas Rn from depth (> 2 m) is a significant contributor to Rn availability near the surface. Zones highest in emanation occur where fine pedogenic phases: gibbsite, amorphous silica, and iron oxyhydroxide are most abundant. Mass balance analyses of this soil-saprolite profile are in progress and preliminary indicate that a high-emanation zone corresponds to the upper portion of a zone of accumulation of U and Ba.

2075 (NEDO-GET–9211) **Surveys and studies on soil pollution/changes assessment using surface ecology information and soil recovery system.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 96p. (In Japanese). Sponsored by New Energy and Industrial Technology Development Organization, Tokyo (Japan). Order Number DE94714899. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Based on the current situation in soil pollution and soil changes, this paper discusses their effects on the ecological systems, and preventive technologies. Soil pollutions discussed included those caused by agricultural chemicals, chemical fertilizers, heavy metals, oils, and radiation. The soil changes were investigated as to acidification and salinization. Legal regulations on soil environments must be handled in the future from a viewpoint of environmental problems of a global scale. The effects on the ecological system are complex, whereas productivities and qualities of field crops should be verified from a standpoint of soil environment preservation. Major technologies to restore polluted soils may include oxidation, incineration, pyrolysis, melting, rinsing, extraction, adsorption, and chemical reactions. Since these processes consume fossil fuels and adsorbers, considerations must be given on effects on energies and global environments. Expected for the future is a soil restoration process using bio-technologies, and a conception for 'bioecommunication system' is proposed in the paper. The system is intended to utilize effectively items of information that appear on the ecological system and functions possessed by the ecological system for restoring the soil environments. 227 refs., 12 figs., 19 tabs.

2076 (NUREG/CR–6108) **Spherical diffusion of tritium from a point of release in a uniform unsaturated soil: A deterministic model for tritium migration in an arid disposal site.** Smiles, D.E. (Univ. of California, Berkeley, CA (United States). Dept. of Environmental Science, Policy and Management); Gardner, W.R.; Schulz, R.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; California Univ., Berkeley, CA (United States). Dept. of Environmental Science Policy and Management. Oct 1993. 28p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Tritium (Tr), when released as tritiated water at a point in a uniform and relatively dry soil, redistributes in both the liquid and vapor phases. The flux density of Tr in the liquid will exceed that in the vapor phase provided the water content is greater than approximately 15% of the total soil porosity. Thus Tr redistribution must be modeled recognizing transfer in parallel in both phases. The authors use the diffusion equation cast in spherical coordinates to analyze this problem in order to provide a basis for design of field experiments, and to offer observations on the long term behavior of such systems. The solution of the diffusion equation permits calculation of the evolution of profiles of Tr concentration, within and external to the sphere of released solution, assuming the initial concentration within this sphere to be uniform. The authors also predict the rate of advance of the maximum of Tr as it advances, and attenuates, in the soil. Calculations for the case of 1 million Curies of Tr diluted in 1 liter of water and released at a depth of 20 meters, and 200 meters above the water table, are demonstrated. If the soil has an initial water volume fraction of 0.06 and total porosity of 0.3 they show, for example, that at 5 meters from the point of discharge, the Tr concentration increases to a maximum in 24 years and then slowly declines. That maximum is 1 Curie/liter. The concentration in the gas phase will be 5 orders-of-magnitude less than this. At 60 meters the maximum ever reached in the liquid phase is ca 10^{-21} Ci/liter; that maximum will be achieved after 408 years. The authors discuss the effects of variation in the volume fractions of water and air originally present in the soil on the effective diffusion coefficient of Tr in soil, consider the effects of a net flux of water in the system, and identify questions to be answered to achieve safe systematic disposal of tritium in the deep unsaturated zone of desert soil.

2077 (ORNL/ER–143) **A radiological and chemical investigation of the 7500 Area Contamination Site at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Williams, J.K.; Foley, R.D.; Tiner, P.F.; Hatmaker, T.L.; Uziel, M.S.; Swaja, R.E. Oak Ridge National Lab., TN (United States). May 1993. 214p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002751. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological and chemical investigation of the 7500 Area Contamination Site at Oak Ridge National Laboratory (ORNL) was conducted intermittently from February 1992 through May 1992. The investigation was performed by the Measurement Applications and Development Group of the Health and Safety Research Division of ORNL at the request of the US Department of Energy's Oak Ridge Operations Office and the ORNL Environmental Restoration Program. Results of this investigation indicate that the source of radioactive contamination at the point of the contamination incident is from one of the underground abandoned lines. The contamination in soil is likely the result of residual contamination from years of waste transport and maintenance operations (e.g., replacement of degraded joints, upgrading or replacement of entire pipelines, and associated landscaping activities). However, because (1) there is currently an active LLW line positioned in the same subsurface trench with the abandoned lines and (2) the physical condition of the abandoned lines may be brittle, this inquiry could not determine which abandoned line was responsible for the subsurface contamination. Soil sampling at the location of the contamination incident and along the pipeline route was performed in a manner so as not to damage the active LLW line and abandoned lines. Recommendations for corrective actions are included.

2078 (PNL–8823) **An evaluation of the environmental fate and behavior of munitions materiel (tetryl and polar metabolites of TNT) in soil and plant systems: Preliminary evaluation of TNT-polar metabolites in plants.** Fellows, R.J.; Harvey, S.D.; Cataldo, D.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041137. Source: OSTI; NTIS; INIS; GPO Dep.

A preliminary study was conducted to elucidate the nature of the polar metabolites reported for plant tissues and xylem exudates following root accumulation of trinitrotoluene. Studies focused on the nature of the proposed conjugates of TNT-residues in xylem exudates of bush beam plants. Use of enzymatic methods failed to demonstrate that the conjugates were carbohydrate based, but acid hydrolysis indicated that the conjugates may be protein based. Of the five polar conjugates isolated from exudates, the presence of aminodinitrotoluene isomers and one unknown TNT residue was demonstrated.

2079 (PNL-SA–22765) **A teleoperated system for remote site characterization.** Sandness, G.A. (Pacific Northwest Lab., Richland, WA (United States)); Richardson, B.S.; Pence, J. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308159–3: SOAR 93: space operations, applications, and research conference, Houston, TX (United States), 3-5 Aug 1993). Order Number DE94001674. Source: OSTI; NTIS; INIS; GPO Dep.

The detection and characterization of buried objects and materials is an important first step in the restoration of burial sites containing chemical and radioactive waste materials at Department of Energy (DOE) and Department of Defense (DOD) facilities. To address the need to minimize the exposure of on-site personnel to the hazards associated with such sites, the DOE Office of Technology Development and the US Army Environmental Center have jointly supported the development of the Remote Characterization System (RCS). One of the main components of the RCS is a small remotely driven survey vehicle that can transport various combinations of geophysical and radiological sensors. Currently implemented sensors include ground-penetrating radar, magnetometers, an electromagnetic induction sensor, and a sodium iodide radiation detector. The survey vehicle was constructed predominantly of non-metallic materials to minimize its effect on the operation of its geophysical sensors. The system operator controls the vehicle from a remote, truck-mounted, base station. Video images are transmitted to the base station by an radio link to give the operator necessary visual information. Vehicle control commands, tracking information, and sensor data are transmitted between the survey vehicle and the base station by means of a radio ethernet link. Precise vehicle tracking coordinates are provided by a differential Global Positioning System (GPS). The sensors are environmentally protected, internally cooled, and interchangeable based on mission requirements. To date, the RCS has been successfully tested at the Oak Ridge National Laboratory and the Idaho National Engineering Laboratory.

2080 (PNL-SA–23102) **Sensors in outdoor environmental monitoring and site remediation.** Wise, B.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9309247–2: National Institute of Standards and Technology (NIST) workshop on gas sensors, Gaithersburg, MD (United States), 8-9 Sep 1993). Order Number DE94001671. Source: OSTI; NTIS; GPO Dep.

A special session on sensors in outdoor environmental monitoring and site remediation was held as part of the NIST Workshop on Gas Sensors. This manuscript summarizes the main points of the workshop. Application areas, issues of concern, and potentially fruitful areas for further research and development were discussed. The main conclusion of the group was that the problems and potential solutions to problems in environmental monitoring were common to other application areas of sensing as well. Of particular concern to the group were the many barriers to final development and commercialization of sensors. Barriers included lack of information on potential markets lack of support of development, (as opposed to more basic research), and difficulties in developing the final packaging for a device. The characterization and development of chemically selective materials for sensor coatings was viewed by the group as a particularly important area for future research.

2081 (SAND–93-7077C) **Electrokinetic extraction of chromate from unsaturated soils.** Mattson, E.D. (SAT-UNSAT, Inc., Albuquerque, NM (United States)); Lindgren, E.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9309146–6: 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management, Atlanta, GA (United States), 27-29 Sep 1993). Order Number DE94002042. Source: OSTI; NTIS; INIS; GPO Dep.

Heavy-metal contamination of soil and groundwater is a widespread problem in industrial nations. Remediation by excavation of such sites may not be cost effective or politically acceptable. Electrokinetic remediation is one possible remediation technique for in situ removal of such contaminants from unsaturated soils. Previous papers discussing the work performed by researchers at Sandia National Laboratories (SNL) and Sat-Unsat, Inc. (SUI) (Lindgren et al., 1991, 1992, 1993) focused on the transport of contaminants and dyes by electrokinetics in unsaturated soils. These experiments were conducted with graphite electrodes with no extraction system. As the contaminants migrated through the soil, they increased in concentration at the electrode creating a diffusion flux in the opposite direction. This paper discusses a technique to remove the contaminants from unsaturated soils once they have reached an electrode.

2082 (UCRL-ID–114158) **Report on the radiochemical and environmental isotope character for monitoring well UE-1-q: Groundwater Characterization Program.** Davisson, M.L.; Hudson, G.B.; Kenneally, J.; Nimz, G.J.; Rego, J.H. Lawrence Livermore National Lab., CA (United States). Jun 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000352. Source: OSTI; NTIS; INIS; GPO Dep.

Well UE-1-q is located in the northeastern portion of area 1 of the Nevada Test Site in southwestern Nevada, 1244.1 meters above sea level. The well was originally an exploratory hole drilled to a depth of 743 meters below the surface (mbs) by LANL in November of 1980. In May 1992, the Groundwater Characterization Program (GCP) extended the total depth to approximately 792.5 mbs. UE-1-q is cased to a total depth of 749.5 mbs, with the remaining uncased depth exposed exclusively to Paleozoicaged carbonate rock, the principle zone of groundwater sampling. Geologic logging indicates approximately 390 meters of tuffaceous and calcareous alluvium overlies 320 meters of Tertiary-aged volcanic ash-flow and bedded tuffs. Paleozoic carbonate lithology extends from 716 mbs to the total well depth and is separated from the overlying Tertiary volcanic deposits by 6 meters of paleocolluvium. This report outlines the results and interpretations of radiochemical and environmental isotopic analyses of groundwater sampled from UE-1-q on July 10, 1992 during the well pump test following well development. In addition, results of the field tritium monitoring performed during the well drilling are reported in Appendix 1. Sampling, analytical techniques, and analytical uncertainties for the groundwater analyses are presented in Appendix 2.

2083 (UCRL-JC–110327) **Electrical resistance tomography used to monitor subsurface steam injection.** Ramirez, A. (Lawrence Livermore National Lab., CA (United States)); Daily, W.; Owen, E.; Chesnut, D.; LaBrecque, D. Lawrence Livermore National Lab., CA (United States). Apr 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-921006–2: 62. annual meeting of the Society of Exploration Geophysicists, New Orleans, LA (United States), 25-29 Oct 1992). Order Number DE94000304. Source: OSTI; NTIS; GPO Dep.

We used electrical resistance tomography (ERT) to map the subsurface distribution of a steam flood as function of time as part of a prototype environmental restoration process performed by the Dynamic Underground Stripping Project. We evaluated the capability of ERT to monitor changes in the soil resistivity during the steam injection process using a dipole-dipole measurement technique to measure the bulk electrical resistivity distribution in the soil mass. The injected steam caused changes in the soil's resistivity because the steam displaced some of the native pore water, increased the pore water and soil temperatures and changed the ionic content of the pore water. We could detect the effects of steam invasion by mapping changes in the soil resistivity as a function of space and

time. The ERT tomographs are compared with induction well logs, formation temperature logs and lithologic logs. These comparisons suggest that the ERT tomographs mapped the formation regions invaded by the steam flood. The data also suggest that steam invasion was limited in vertical extent to a gravel horizon at depth of approximately 43 m. The tomographs show that with time, the steam invasion zone extended laterally to all areas monitored by the ERT technique.

2084 (UCRL-JC–114175) **On the role of high performance computing for simulating subsurface flow and chemical migration.** Tompson, A.; Ashby, S.; Falgout, R.; Smith, S. Lawrence Livermore National Lab., CA (United States). Jun 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309156–2: 8. international conference on finite elements in fluids: new trends and applications, Barcelona (Spain), 20-24 Sep 1993). Order Number DE93040495. Source: OSTI; NTIS; GPO Dep.

The use of large-scale computing for simulating fluid flow and chemical migration in subsurface formations is reviewed. Increasingly, intensive, highly-resolved model calculations are being used experimentally to study the impacts of small-scale material heterogeneities on coupled flow and transport phenomena, and are becoming easier to carry out with advanced computing hardware. These issues are illustrated through an example problem focused on the calculation of steady fluid flow and chemical migration in a detailed, three-dimensional formation with synthetically-derived nonuniformities in material properties. Here the interest is in examining the coupled impacts on chemical mobility induced by nonuniform sorption reactions and heterogeneous flow fields. Ongoing activities are now emphasizing parallel computations for larger, dynamic, and nonlinear (two-phase) flow problems, improved interpretive methods for defining detailed material property distributions, as well as specific applications at real field sites.

2085 (UCRL-JC–115005) **Thermoelectric cooled, purge-and-trap device for enhancing the utility of fiber optic VOC sensors.** Mizusawa, E.A.; Daley, P.F.; Kyle, K.R.; Langry, K.C.; Angel, S.M. Lawrence Livermore National Lab., CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309199–10: Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation, Boston, MA (United States), 7-10 Sep 1993). Order Number DE94001772. Source: OSTI; NTIS; GPO Dep.

A thermoelectric cooled, purge-and trap device (TEC) has been developed to enhance the utility of fiber optic VOC sensors. This simple device consists of a thin copper radiator which is sandwiched between two thermoelectric coolers. Two water-cooled, copper heat sinks are used to maintain the hog side surfaces of the thermoelectric coolers at 5 degrees C, allowing internal surface temperatures of the radiator to be controlled between 5 degrees C to −43 degrees C. This paper describes the use of the TEC with a reversible, fiber optic, carbon tetrachloride sensor. The sensor by itself has a detection limit of around 1,000 ppmv carbon tetrachloride in nitrogen. When the sensor is used with the TEC, vapor phase concentrations down to 100 ppmv can be measured.

2086 (WAPD-RC/E(EE)–2838) **1992 Effluent and environmental monitoring report for the Bettis Atomic Power Laboratory Pittsburgh Site.** Bettis Atomic Power Lab., West Mifflin, PA (United States). [1992]. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. Order Number DE94001995. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the radiological and non-radiological environmental monitoring programs for 1992 at the Bettis-Pittsburgh Site are presented. The results obtained from the monitoring programs demonstrate that the existing procedures ensured that environmental releases during 1992 were in accordance with applicable Federal and State regulations. Evaluation of the environmental data indicates that operation of the Laboratory continues to have no adverse effect on the quality of the environment. A conservative assessment of radiation exposure to the general public as a result of Laboratory operations demonstrated that the dose received by any member of the public was well below the most restrictive dose limits established by the Environmental Protection Agency and the Department of Energy.

2087 (WHC-EP–0679) **Groundwater impact assessment report for the 284-WB Powerplant Ponds.** Alexander, D.J.; Johnson, V.G.; Lindsey, K.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94001228. Source: OSTI; NTIS; INIS; GPO Dep.

As required by the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement Milestone M-17-00A), this report assesses the impact of wastewater discharged to the 284-WB Powerplant Ponds on groundwater quality. The assessment reported herein expands upon the initial analysis conducted between 1989 and 1990 for the Liquid Effluent Study Final Project Plan.

2088 (WHC-SA–1941) **Hanford Small Building Demolition Program.** Diebel, J.A.; Douglas, L.M.; Shuck, R.G. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–42: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94002409. Source: OSTI; NTIS; INIS; GPO Dep.

Over 1,100 buildings currently exist on the Hanford Site. Many of these structures are outdated and no longer needed to support the environmental restoration mission. The Hanford Small Building Demolition Program is part of a combined effort of an Accelerated Decontamination and Decommissioning (D and D) Program and Landlord Site Preparation and Stabilization Program aimed at reducing the inventory of noncontaminated surplus facilities onsite. The reduction of surplus facilities results in reduced surveillance and maintenance (S and M) costs and eliminates the safety and environmental hazards associated with aging buildings. The project involves decommissioning up to 80 surplus facilities over the next five years.

2089 (WHC-SA–2064) **Well venting and application of passive soil vapor extraction at Hanford and Savannah River.** Rohay, V.J. (Westinghouse Hanford Co., Richland, WA (United States)); Rossabi, J.; Looney, B.; Cameron, R.; Peters, B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931095–34: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001693. Source: OSTI; NTIS; INIS; GPO Dep.

At the Hanford and Savannah River Sites, wells with open intervals in the unsaturated zone have been observed to "breathe", i.e., to inhale ambient air from the surface and to exhale soil gas to the atmosphere. This breathing results primarily from the difference in pressure that develops between the soil pressure near the open interval of a well and the barometric pressure. Volatile organic compounds (VOC) have been identified at both Hanford (carbon tetrachloride) and Savannah River (trichloroethylene and tetrachloroethylene). Passive vapor extraction (PVE) refers to the enhancement and application of this natural breathing phenomenon as a remediation method for increased VOC removal rates from the unsaturated zone. Passive vapor extraction is proposed as a complementary technology to be used with active vapor extraction (AVE). The AVE system would be used to extract soil gas from the high VOC concentration, highly permeable zones. The enhanced PVE would be used to address those zones of lower VOC concentration and those zones where extraction is limited by mass transfer and diffusion. The primary advantages of PVE application are low capital costs and minimal operating costs. This combination allows for many small PVE systems to be placed on individual wells and for the systems to operate for the extended periods of time associated with remediation of sites in which soil-gas transport is diffusion limited.

2090 (WHC-SD-EN-AP–145) **C-018H Pre-Operational Baseline Sampling Plan.** Guzek, S.J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States). 20 Aug 1993. 38p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041106. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this task is to field characterize and sample the soil at selected locations along the proposed effluent line routes for Project C-018H. The overall purpose of this effort is to meet the proposed plan to discontinue the disposal of contaminated liquids into the Hanford soil column as described by DOE (1987). Detailed information describing proposed transport pipeline route and associated Kaiser Engineers Hanford Company (KEH) preliminary drawings (H288746...755) all inclusive, have been prepared by KEH (1992). The information developed from field monitoring and sampling will be utilized to characterize surface and subsurface soil along the proposed C-018H effluent pipeline and it's associated facilities. Potentially existing contaminant levels may be encountered therefore, soil characterization will provide a construction preoperational baseline reference, develop personnel safety requirements, and determine the need for any changes in the proposed routes prior to construction of the pipeline.

2091 (WHC-SD-EN-AP–147) **Description of work for vadose borings in support of 200-UP-2 Unit.** Kelty, G.G. Westinghouse Hanford Co., Richland, WA (United States). 27 Aug 1993. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041113. Source: OSTI; NTIS; GPO Dep.

This description of work (DOW) details the field activities associated with the vadose zone drilling and soil sampling in the 200-UP-2 Operable Unit (Task 2, 3, and 5) and will serve as a field guide for those performing the work. It will be used in conjunction with the 200-UP-2 RCRA Facility Investigation/Corrective Measures Study (DOE-RL 1993a,[LFI]) and Site Characterization Manual (WHC 1988a). Vadose zone borings are being constructed to characterize the vertical and horizontal extent of contaminants in sediments within and beneath the cribs. The locations for the proposed borings are presented in Figure 1. The contaminants of concern for the project are presented in Table 1.

2092 (WHC-SD-EN-TI–164) **382-1 underground gasoline storage tank soil-gas survey.** Jacques, I.D. Westinghouse Hanford Co., Richland, WA (United States). 27 Aug 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE93041109. Source: OSTI; NTIS; GPO Dep.

A soil-gas survey was conducted near the 382 Pump House in the 300 Area of the Hanford Site. The objective of the soil-gas survey was to characterize the extent of petroleum product contamination in the soil beneath the 382-1 underground gasoline storage tank excavation. The tank was discovered to have leaked when it was removed in September 1992. The results of this soil-gas survey indicate petroleum products released from the 382-1 tank are probably contained in a localized region of soil directly beneath the tank excavation site. The soil-gas data combined with earlier tests of groundwater from a nearby downgradient monitoring well suggest the spilled petroleum hydrocarbons have not penetrated the soil profile to the water table.

2093 (WHC-SD-EN-TI–198) **100 Area Columbia River sediment sampling.** Weiss, S.G. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); International Technology Corp., Richland, WA (United States). 8 Sep 1993. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94000738. Source: OSTI; NTIS; INIS; GPO Dep.

Forty-four sediment samples were collected from 28 locations in the Hanford Reach of the Columbia River to assess the presence of metals and man-made radionuclides in the near shore and shoreline settings of the Hanford Site. Three locations were sampled upriver of the Hanford Site plutonium production reactors. Twenty-two locations were sampled near the reactors. Three locations were sampled downstream of the reactors near the Hanford Townsite. Sediment was collected from depths of 0 to 6 in. and between 12 to 24 in. below the surface. Samples containing concentrations of metals exceeding the 95 % upper threshold limit values (DOE-RL 1993b) are considered contaminated. Contamination by arsenic, chromium, copper, lead, and zinc was found. Man-made radionuclides occur in all samples except four collected opposite the Hanford Townsite. Man-made radionuclide concentrations were generally less than 1 pCi/g.

2094 (WSRC-MS–93-039) **Characterization and reclamation assessment for the Central Shops Diesel Storage Facility, Savannah River Site, Aiken, South Carolina.** Fliermans, C.B.; Hazen, T.C.; Bledsoe, H. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-930932–1: International symposium on subsurface microbiology, Bath (United Kingdom), 19-24 Sep 1993). Order Number DE94001809. Source: OSTI; NTIS; GPO Dep.

The contamination of subsurface terrestrial environments by organic contaminants is a global phenomenon. The remediation of such environments requires innovative assessment techniques and strategies for successful clean-ups. Central Shops Diesel Storage Facility at Savannah River Site was characterized to determine the extent of subsurface diesel fuel contamination using innovative approaches and effective bioremediation techniques for clean-up of the contaminant plume have been established.

2095 (WSRC-MS–93-158) **Development of novel sol-gel indicators (SGI's) for in-situ environmental measurements.** Livingston, R.R.; Wicks, G.G.; Baylor, L.C.; Whitaker, M.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9310186–2: Environmental restoration on laser options, Atlanta, GA (United States), 24-28 Oct 1993). Order Number DE94001181. Source: OSTI; NTIS; INIS; GPO Dep.

Organic indicator molecules have been incorporated in a porous sol- gel matrix coated on the end of a fiber-optic lens assembly to create sensors for in situ environmental measurements. Probes have been made that are sensitive to pH and uranyl concentration. The use of fiber optics allows the probe to be lowered into a well or bore hole, while support equipment such as a spectrophotometer and computer may be situated hundreds of meters away.

2096 (WSRC-MS–93-390) **Implementation of a laboratory information management system for environmental regulatory analyses.** Spencer, W.A.; Aiken, H.B.; Spatz, T.L.; Miles, W.F.; Griffin, J.C. Westinghouse Savannah River Co., Aiken, SC (United States). 7 Sep 1993. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931081–1: 34. ORNL/DOE conference on analytical chemistry in energy technology, Gatlinburg, TN (United States), 5-7 Oct 1993). Order Number DE94001198. Source: OSTI; NTIS; GPO Dep.

The Savannah River Technology Center created a second instance of its ORACLE based PEN LIMS to support site Environmental Restoration projects. The first instance of the database had been optimized for R&D support and did not implement rigorous sample tracking, verification, and holding times needed to support regulatory commitments. Much of the R&D instance was transferable such as the work control functions for backlog reports, work assignment sheets, and hazard communication support. A major enhancement of the regulatory LIMS was the addition of features to support a "standardized" electronic data format for environmental data reporting. The electronic format, called "AN92", was developed by the site environmental monitoring organization and applies to both onsite and offsite environmental analytical contracts. This format incorporates EPA CLP data validation codes as well as details holding time and analytical result reporting requirements. The authors support this format by using special SQL queries to the database. The data is then automatically transferred to the environmental databases for trending and geological mapping.

2097 (WSRC-MS–93-511) **Groundwater cleanup and update of the Savannah River Site experience.** Bergren, C.L.; Horvath, J.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–15: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001184. Source: OSTI; NTIS; GPO Dep.

A full scale pump and treat groundwater remediation program which addresses a large plume of volatile organic solvents has

been ongoing at the Savannah River Site since 1985. The system has recovered over 135,000 kilograms of solvent and is containing the center of the plume. While overall protection is being achieved, reducing the concentration of contaminants to regulatory acceptable levels is problematic.

2098 (WSRC-MS–93-513) **Soil gas waste site screening at the Savannah River Site.** Wyatt, D.E. (Westinghouse Savannah River Co., Aiken, SC (United States)); Looney, B.B.; Price, V.; Richers, D.M.; Pirkle, R.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931095–12: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001182. Source: OSTI; NTIS; GPO Dep.

The environmental restoration effort at Savannah River Site (SRS) has utilized soil gas sampling as a principal method for screening and characterizing waste sites. More than 98 waste sites have been evaluated using this technology at scattered locations across the 310 square mile area of the facility, generating over 6,000 soil gas samples arranged in clustered data sets of 25 to 2,000 samples each. Additionally, a regional background survey of soil gases has been carried out over a 500 square mile area which includes the SRS for the purpose of determining the background concentrations of species of interest which relate to waste site investigations. Although selected waste sites have been sampled using a Geoprobe soil gas sampling system to depths of 25 feet, for the most part the soil gas studies at SRS have been carried out at a depth of about 3 feet. In many cases this depth is several feet above the depth of waste burial. A series of "groundsheet" studies have been carried out which reveal that barometric pumping is the mechanism which is responsible for the presence near the surface of volatile components of the more deeply buried waste. These studies found that barometric pumping causes soil gases containing volatile contaminants to migrate through the ground surface into the atmosphere. The surveys monitored the presence of the C_1–C_4 hydrocarbons, the C_5–C_{10} normal paraffins, the gasoline range aromatics (BTEX), and selected chlorinated hydrocarbons. In a large majority of the shallow surveys conducted, a free-gas method of soil gas technology was employed in which the soil gas sample was obtained directly from the pore space. At selected waste sites, soil cores were taken and soil gas was analyzed from a portion of the heated headspace over a soil/water slurry. At most waste sites, shallow (1 foot) soil cores were taken and analyzed for soil mercury using a pyrolysis screening technique commonly used in the minerals industry.

2099 (WSRC-TR–93-391) **Sanitary Landfill groundwater monitoring report: Second quarter 1993.** Westinghouse Savannah River Co., Aiken, SC (United States). Aug 1993. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001175. Source: OSTI; NTIS; GPO Dep.

This report contains analytical data for samples taken during second quarter 1993 from wells of the LFW series located at the Sanitary Landfill at the Savannah River Site. The data are submitted in reference to the Sanitary Landfill Operating Permit (DWP-087A). The report represents monitoring results that equaled or exceeded the Safe Drinking Water Act final Primary Drinking Water Standards (PDWS) or screening levels, established by the US Environmental Protection Agency the South Carolina final Primary Drinking Water Standards for lead or the SRS flagging criteria.

2100 (YJT–93-02) **Ore potential of basic rocks in Finland.** Reino, J. (Outokumpu Mining Services Oy, Espoo (Finland)); Ekberg, M.; Heinonen, P.; Karppanen, T.; Hakapaeae, A.; Sandberg, E. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Feb 1993. 87p. (In Finnish). Order Number DE94605484. Source: OSTI; NTIS; INIS.

The report is associated with a study programme on basic rocks, which has the aim to complement the preliminary site investigations on repository for TVO's (Teollisuuden Voima Oy) spent nuclear fuel. The report comprises a mining enterprise's view of the ore potential of basic plutonic rocks in Finland. The ores associated with basic plutonic rocks are globally known and constitute a significant share of the global mining industry. The ores comprise chromium, vanadium-titanium-iron, nickel-copper and platinum group element ores. The resources of the metals in question and their mining industry are examined globally. A review of the use of these metals in the industry is presented as well. General factors affecting the mining industry, such as metal prices, political conjunctures, transport facilities, environmental requirements and raw material sources for the Finnish smelters have been observed from the point of view of their future effect on exploration activity and industrial development in Finland. Information on ores and mineralizations associated with Finnish basic rocks have been compiled in the report. The file comprises 4 chromium occurrences, 8 vanadium-titanium-iron occurrences, 13 PGE occurrences and 38 nickel-copper occurrences.

2101 (YJT–93-08) **Evaluation of mineral resource potential of the Finnish precambrian.** Peltonen, K. (Helsinki Univ. of Technology, Espoo (Finland). Lab. of Engineering Geology and Geophysics). Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). May 1993. 93p. (In Finnish). Order Number DE94605485. Source: OSTI; NTIS; INIS.

In the report the undiscovered mineral resource potential of metallogenic regions in Finland is evaluated. The evaluation is based on known deposits. The criteria of the evaluation were: ore and mineral deposit density, regional distribution of valuable metals, and the amount and the nature of prospecting methods used. The information for the study has been collected from the data base for ore minerals maintained by the Geological Survey of Finland. Regions with mineral resource potential conclusively under national average are Presvecokarelidic and Svecokarelidic granitoids and rapakivi Massif. The mineral resource potential of basic rocks in relation to their surface area is multiple compared to non-basic rocks.

2102 (YJT–93-12) **Research into basic rocks types: Summary.** Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Jun 1993. 142p. (In Finnish). Order Number DE94605486. Source: OSTI; NTIS; INIS.

Teollisuuden Voima Oy (TVO) has carried out research into basic rock types in Finland. The research programme has been implemented in parallel with the preliminary site investigations for radioactive waste disposal in 1991-1993. The program contained two main objectives: firstly, to study the properties of the basic rock types and compare those with the other rock types under the investigation; secondly, to carry out an inventory of rock formations consisting of basic rock types and suitable in question for final disposal. A study of environmental factors important to know regarding the final disposal was made of formations identified. In total 159 formations exceeding the size of 4 km^2 were identified in the inventory. Of these formations 97 were intrusive igneous rock types and 62 originally extrusive volcanic rock types. Deposits consisting of ore minerals, industrial minerals or building stones related to these formations were studied. Environmental factors like natural resources, protected areas or potential for restrictions in land use were also studied.

2103 (Y/TS–1016) **Identification and characterization of wetlands in the Bear Creek watershed.** Rosensteel, B.A. (JAYCOR, Oak Ridge, TN (United States)); Trettin, C.C. Oak Ridge Y-12 Plant, TN (United States); Oak Ridge National Lab., TN (United States). Oct 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (ORNL/M–3070). Order Number DE94002538. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4075.

The primary objective of this study was to identify, characterize, and map the wetlands in the Bear Creek watershed. A preliminary wetland categorization system based on the Cowardin classification system (Cowardin et al. 1979) with additional site-specific topographic, vegetation, and disturbance characteristic modifiers was developed to characterize the type of wetlands that exist in the Bear Creek watershed. An additional objective was to detect possible relationships among site soils, hydrology, and the occurrence of wetlands in the watershed through a comparison of existing data with the field survey. Research needs are discussed in the context of wetland functions and values and regulatory requirements for wetland impact assessment and compensatory mitigation.

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Refer also to citation(s) 381, 382, 384, 386, 389, 405, 407, 435, 459, 826, 1907, 1908, 1909, 1954, 1978, 1980, 2001, 2002, 2003, 2005, 2016, 2027, 2038, 2070, 2185, 2186, 2197, 2221

2104 (CEA-CONF–11503) **Report on the state of the Rhone river and the Rhone valley.** Lambrechts, A. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 23p. (In French). (CONF-9205375–: Meeting on the radioecological conditions of the Rhone River and its valley, Avignon (France), 23 May 1992). Order Number DE94604433. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper we present the radioecological impact of nuclear installations on the Rhone river and the studies realized by the IPSN (Institute of Protection and Nuclear Safety).

2105 (ETDE/JP-mf–94714701) **Study on structure of benthic boundary layer in coastal waters.** Washimi, E. (National Institute for Resources and Environment, Tsukuba (Japan)). National Inst. for Resources and Environment, Tsukuba (Japan). 25 Feb 1993. 116p. (In Japanese). Order Number DE94714701. Source: OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan.

Chemical material acting as pollutant sources is being discharged into the atmosphere and oceans to be diffused and accumulated. The present paper is concerned with physical processes, especially the tidal flow caused by semi-diurnal tide, in the coastal waters, one of the oceanic environments, and the turbulent structure of this flow in the layer near the sea bottom and the benthic boundary layer was studied from the viewpoint of field study on the unsteady flow. Further investigation was made as to whether the standard theories can be applied, and, if not, whether special theories are required in the analysis of observed data. In order to consider the unsteady phenomena of the tidal flow, a reflector plate type three-dimensional ultrasonic current meter which can precisely measure the characteristic amount of turbulence in the flow system was developed and used in the field experiment. Furthermore a simple analytical method for the results was studied. As the outcome of this study, it was found that the time required for establishment of pseudo unsteadiness assumed for the flow in three directions is about ten minutes and similarity between the benthic boundary layer and the atmospheric boundary layer was acknowleged. 84 refs., 71 figs., 17 tabs.

2106 (GTK-YST–82, pp. 23-32) **Deep groundwater flow at Palmottu.** Niini, H. (Helsinki Univ. of Technology, Espoo (Finland). Lab. of Engineering Geology and Geophysics); Vesterinen, M.; Tuokko, T.; Blomqvist, R.; Kuivamaeki, A.; Hakkarainen, V. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

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Further observations, measurements, and calculations aimed at determining the groundwater flow regimes and periodical variations in flow at deeper levels were carried out in the Lake Palmottu (a natural analogue study site for radioactive waste disposal in southwestern Finland) drainage basin. These water movements affect the migration of radionuclides from the Palmottu U-Th deposit. The deep water flow is essentially restricted to the bedrock fractures which developed under, and are still affected by, the stress state of the bedrock. Determination of the detailed variations was based on fracture-tectonic modelling of the 12 most significant underground water-flow channels that cross the surficial water of the Palmottu area. According to the direction of the hydraulic gradient the deep water flow is mostly outwards from the Palmottu catchment but in the westernmost section it is partly towards the centre. Estimation of the water flow through the U-Th deposit by the water-balance method is still only approximate and needs continued observation series and improved field measurements.

2107 (GTK-YST–82, pp. 33-40) **Structural interpretation for mapping of groundwater flow paths at Palmottu U-Th-mineralization.** Paananen, M. (Geological Survey of Finland, Espoo (Finland)); Kuivamaeki, A. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

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The structural features of the Palmottu U-Th-deposit (a natural analogue study site for radioactive waste disposal in southwestern Finland) were studied by drill core logging and geophysical measurements, the main focus of interest being in recognizing fracture zones or fractures that might be important pathways for groundwater flow. A geological map based on the drill core observations was compiled and additional data concerning lithology, fracturing and U/Th-content were transferred to the PC-XPLOR-database. At present the database consists of 53 drill holes. In order to determine the geometry of potentional hydraulic zones, charged potential (mise-a-la-masse) measurements were carried out in ten drill holes in the central part of the drilling site. Fracture zones that possibly cut the mineralization were of special interest. On the basis of the measurements, the location and orientation of 6-7 separate galvanic (and possible hydraulic) structures could be interpreted. The dips of these structures are often parallel to the general dip of the geological structures, and no structures perpendicular or nearly perpendicular to the mineralization were encountered. However, three of the structures interpreted seem to cut the formation at a low angle.

2108 (GTK-YST–82, pp. 41-63) **Characterization of natural groundwater colloids at Palmottu.** Vuorinen, U. (Technical Research Centre of Finland, Espoo (Finland). Reactor Lab.); Kumpulainen, H. Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

Characterization of groundwater colloids (size range from 2 nm to 500 nm) in the Palmottu natural analogue (for radioactive waste disposal in Finland) area was continued by sampling another drill hole, 346, at three depths. Results evaluated so far indicate the presence of both organic and inorganic colloids. In terms of chemical composition and morphology, the inorganic colloids differ from those found in previous studies. According to SEM/EDS and STEM/EDS they mostly contain Ca and are spherical in shape. At this stage further characterization and evaluation of results is provisional and does not allow very accurate conclusions to be drawn.

2109 (GTK-YST–82, pp. 79-86) **Geochemical modelling of Na-SO_4 type groundwater at Palmottu using a mass balance approach.** Pitkaenen, P. (Technical Research Centre of Finland, Espoo (Finland). Road, Traffic and Geotechnical Lab.). Geological Survey of Finland, Espoo (Finland). 1993. In *The Palmottu analogue project: Progress Report 1992.* 101p. Order Number DE94605452. Source: OSTI; NTIS; INIS.

Nuclear Waste Disposal Research.

The mass balance chemical modelling technique has been applied to the groundwaters at the Palmottu analogue study site (in southwestern Finland) for radioactive waste disposal. The geochemical modelling concentrates on the evolution of Na-SO_4 type groundwater, which is spatially connected to the uranium mineralization. The results calculated along an assumed flow path are consistent with available field data and thermodynamic constraints. The results show that essential production of sulphides is unrealistic in the prevailing conditions. The increasing concentrations of Na, SO_4 and Cl along the evolution trend seem to have the same source and they could originate mainly from the leakage of fluid inclusions. Some mixing of relict sea water is also possible.

2110 (INIS-BR–3202) **Uranium isotope model used on proportion estimation of deep water mixture.** Bonotto, D.M. (UNESP, Rio Claro, SP (Brazil). Inst. de Geociencias e Ciencias Exatas). Sociedade Brasileira de Geologia, Sao Paulo, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-921299–: 37. Brazilian Congress on Geology., Sao Paulo (Brazil), 9-15 Dec 1992). Order Number DE94604314. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM 234/ground water; URANIUM 234/isotope ratio; URANIUM 238/ground water; URANIUM 238/isotope ratio; BOREHOLES; HYDROLOGY; ISOTOPE DILUTION; NATURAL OCCURRENCE

2111 (NIRS-M–92) **Material circulation in ocean: Removal processes in marine sinding particles.** Nagaya, Yutaka (ed.). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. 64p. (In Japanese). (CONF-9111331–; 19. National Institute of radiological Sciences seminar on environmental research, Chiba (Japan), 28-29 Nov 1991). Order Number DE94719027. Source: OSTI; NTIS; INIS.

This issue is the collection of the papers presented at the 19th National Institute of Radiological Sciences seminar on environmental research. The 2 of the presented papers are indexed individually. (J.P.N.).

2112 (PNL–8789) **Investigation of exposure rates and radionuclide and trace metal distributions along the Hanford Reach of the Columbia River.** Cooper, A.T.; Woodruff, R.K. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000547. Source: OSTI; NTIS; INIS; GPO Dep.

Studies have been conducted to investigate exposure rates, and radionuclide and trace metal distributions along the Columbia River where it borders the Hanford Site. The last major field study was conducted in 1979. With recently renewed interest in various land use and resource protection alternatives, it is important to have data that represent current conditions. Radionuclides and trace metals were surveyed in Columbia River shoreline soils along the Hanford Site (Hanford Reach). The work was conducted as part of the Surface Environmental Surveillance Project, Pacific Northwest Laboratory. The survey consisted of taking exposure rate measurements and soil samples primarily at locations known or expected to have elevated exposure rates.

2113 (PNL–8807) **Impact of environmental dewatering of Lower Granite and Little Goose reservoirs on benthic invertebrates and macrophytes.** Cushing, C.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 31p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000625. Source: OSTI; NTIS; GPO Dep.

An investigation into the effects of dewatering on the benthic fauna in Lower Granite and Little Goose reservoirs was undertaken. Benthos in both the soft bottom regions of the reservoirs as well as those inhabiting the rock rip-rap along the shoreline were studied. These organisms provide an important food resource for both migrating salmonids and resident fish species; thus, impacts of contemplated dewatering schemes require evaluation. The results of these studies indicate that there were no significant, long-term impacts to the soft bottom benthos as a result of dewatering in Little Goose Reservoir. In fact, higher numbers of some taxa indicate that there may have been a washout of these organisms from Lower Granite Reservoir with subsequent deposition in the upper reaches of Little Goose Reservoir. This should be accompanied by a coincident decrease in these organisms in Lower Granite Reservoir. However, we did not have pre-dewatering samples from Lower Granite Reservoir with which we could compare post-filling samples to determine if the dewatering resulted in lower benthic populations.

2114 (PNL–8822) **Lincoln Park shoreline erosion control project: Monitoring for surface substrate, infaunal bivalves and eelgrass, 1993.** Antrim, L.D. (Battelle/Marine Sciences Lab., Sequim, WA (United States)); Thom, R.M.; Gardiner, W.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 32p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041324. Source: OSTI; NTIS; GPO Dep.

In 1988, the US Army Corps of Engineers and the City of Seattle placed material on the upper beach at Lincoln Park, in West Seattle, Washington. The fill served to mitigate shoreline erosion that had caused undercutting and collapse of the seawall in several places. A series of pre- and post-construction studies have been conducted to assess the impacts to marine biota of fill placement and movement of surface substrate. This study was designed to monitor infaunal bivalves and eelgrass from intertidal areas in and adjacent to the area of original fill placement. Findings from this survey were compared to previous survey results to determine (1) if recruitment of infaunal bivalves to the fill area has occurred, (2) if infaunal bivalve densities outside the fill area are stable, and (3) if eelgrass distribution and abundance have remained stable along the adjacent shoreline. To maximize comparability of findings from this survey with previous studies, sampling techniques, transects, and tidal elevations were consistent with previous studies at this site.

2115 (PNL–8828) **Ecological evaluation of proposed dredged material from the John F. Baldwin Ship Channel: Phase 3 – biological testing.** Kohn, N.P. (Battelle/Marine Sciences Lab., Sequim, WA (United States)); Karle, L.M.; Pinza, M.R.; Mayhew, H.L.; White, P.J.; Gruendell, B.D.; Word, J.Q. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 456p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001753. Source: OSTI; NTIS; GPO Dep.

The John F. Baldwin Ship Channel is a 28-mile-long portion of the San Francisco Bay to Stockton Ship Channel, the primary shipping lane through San Francisco Bay and Delta. The San Francisco District of the US Army Corps of Engineers (USACE) is responsible for construction of the John F. Baldwin Ship Channel, which is authorized to be deepened to a project depth of −45 ft relative to mean lower low water (MLLW). Approximately 8.5 million cubic yards (mcy) of sediment will be removed from the channel to reach this project depth. The USACE requested Battelle/Marine Sciences Laboratory (MSL) to conduct testing for ocean disposal under the guidelines in Evaluation of Dredged Material Proposed for Ocean Disposal-Testing Manual (EPA/USACE 1991). This testing manual contains a tiered evaluation approach developed specifically for ocean disposal of dredged material at a selected site. In this study, John F. Baldwin Ship Channel sediments were evaluated under the Tier III (biological) testing guidance, which is considered to be highly stringent and protective of the environment. The Tier III guidance for ocean disposal testing requires tests of water column effects, (following dredged material disposal), deposited sediment toxicity, and bioaccumulation of contaminants from deposited sediment (dredged material).

2116 (RFP–4738) **Environmental applications of the particle analysis system.** Moritz, E.J.; Hoffman, C.R. EG and G Rocky Flats, Inc., Golden, CO (United States). 28 Sep 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE94002927. Source: OSTI; NTIS; GPO Dep.

This study demonstrates the applicability of particle counting technology for analysis of various water treatment systems at the Rocky Flats Plant. The Particle Analysis System described in this study determined the water quality of samples from environmental remediation, stormwater treatment, and drinking water treatment operations. Samples were measured in either discrete or on-line mode. This data showed filtration efficiencies, particle counts, particle size distributions, and real-time treatment system performance. Particle counting proved more sensitive than the turbidimetric measurement technique commonly used by the water treatment industry. Particle counting is a two-dimensional measurement of counts and sizes, whereas turbidity is a one-dimensional measurement of water clarity. Samples showing identical turbidities could be distinguished easily with the Particle Analysis System. The Particle Analysis System proved to be an efficient and reliable water quality measurement tool, and it is applicable to a variety of water treatment systems at the Rocky Flats Plant.

2117 (STUK-A–103) **Monitoring of radionuclides in the Baltic Sea in 1989-1990: Supplemet 10 to Annual Report STUK-A–89.** Ilus, E.; Sjoeblom, K.L.; Ikaeheimonen, T.; Saxen, R.; Klemola, S. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Feb 1993. 38p. Order Number DE94605489. Source: OSTI; NTIS; INIS.

Monitoring of radioactive substances in the Baltic Sea continued within the framework of the Finnish national monitoring programme. Samples of sea water, bottom sediment and fish were collected for radionuclide analyses. All samples were analysed for gamma-emitting radionuclides and some also for ^{90}Sr and transuranic elements. The general levelling of Chernobyl derived ^{137}Cs and ^{134}Cs in the water mass of the Baltic Sea, which had started soon

after the fallout situation, continued in 1989. The activity concentration of ^{137}Cs was about the same level (120-160 Bq/m^3) in surface water throughout the Baltic Sea area except in some coastal areas. The cesium concentrations had levelled vertically as well as horizontally. In 1990, the cesium concentrations of surface water decreased further in other sea areas, but not in the Bothnian Sea, where somewhat higher values were detected once more. In bottom sediments the total amounts of ^{137}Cs had clearly increased between 1988 and 1990 which indicates that fresh fallout was still settling on the bottom. No increase was found in the total amounts of $^{239,240}Pu$. Small amounts of ^{60}Co were detected in the surface sediment of our sampling station in the Northern Baltic proper. ^{137}Cs concentrations in Baltic herring ranged from 17 to 32 Bq/kg fresh weight and pike from 22 to 290 Bq/kg fresh weight, the maximum values being in the samples supplied from the Vaasa archipelago. The internal radiation dose received by Finns from eating Baltic Sea fish was 0.01mSv both in 1989 and in 1990. (orig.).

2118 (SVF–473) **Membrane technology at different industrial plants.** Ramsbaeck, B. (AaF Energikonsult Stockholm AB (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). 1993. 99p. (In Swedish). Order Number DE94709790. Source: OSTI; NTIS.

In recent years the technique to treat water by ultrafiltration (UF) and reverse osmosis (RO) has been improved. The project has covered investigations of pilot plant equipment at different plants. The examinations have proved that both RO and UF are very usable methods. In both cases particles and colloids are very effectively separated. In this respect the membrane technique is better than what is generally attained by the flocculation or the ion exchange technique. Most effectively, the organic substances is reduced by RO. The reduction is 88-98 % when the $KMnO_4$-consumption represents the lower level whereas TOC gives the higher reduction. The same conditions are attained from the UF when the reduction is 70-80 %. If this is compared with the reduction of organic substance in the flocculation and the desalination, it is found that the UF is better than the flocculation and that the RO is quite comparable with the desalination. The reduction of salt with the RO is only 95-98 % whereas there is a reduction of the silica of 90-96 %. This is the great difference between the RO and the desalination. The UF-membrane has a small effect on the content of the salt in the water. The reduction is only 20-25 %. As regards silica it is <10 %. Despite the fact that the UF should be compared with flocculation the moderate reduction of the salt content is positive. When flocculation is used there is an increase of salt because of the flocculation chemicals

2119 (TVA–93040417) **A comparison of methods to evaluate reservoir dissolved oxygen data: Average cross-sectional area versus time X depth integration's.** Dobson, C.L. Tennessee Valley Authority, Chattanooga, TN (United States). Aug 1993. 22p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE93040417. Source: OSTI; NTIS.

This report describes measuring methods of dissolved oxygen in water reservoirs operated by the Tennessee Valley Authority.

2120 (TVA/WM–93/15) **Monitoring and evaluation of aquatic resource health and use suitability in Tennessee Valley Authority reservoirs.** Dycus, D.L.; Meinert, D.L. Tennessee Valley Authority, Chattanooga, TN (United States). Jun 1993. 37p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE93040573. Source: OSTI; NTIS.

TVA initiated a Reservoir Monitoring Program in 1990 with two objectives – to evaluate the health of the reservoir ecosystem and to examine how well each reservoir meets the swimmable and fishable goals of the Clean Water Act. In 1990 reservoir health was evaluated subjectively using a weight-of-evidence approach (a reservoir was deemed healthy if most of the physical, chemical, and biological monitoring components appeared healthy). In the second year (1991) a more objective, quantitative approach was developed using information on five important indicators of reservoir health – dissolved oxygen, chlorophyll, sediment quality, benthic macroinvertebrates, and fishes. The most recent information (1992) was evaluated with the same basic approach, modified to incorporate improvements based on comments from reviewers and additional data. Reservoirs were stratified into two groups for evaluation: run-of-the-river reservoirs and tributary storage reservoirs. Key locations are sampled in each reservoir (forebay, transition zone or midreservoir, inflow, and major embayments) for most or all of these five reservoir health indicators. For each indicator (or metric), scoring criteria have been developed that assign a score ranging from 1 to 5 representing poor to good conditions, respectively. Scores for the metrics at a location are summed and then the sums for all locations are totaled. Each reservoir has one to four sample locations depending on reservoir characteristics. The resultant total is divided by the maximum possible score (all metrics good at all locations) for the reservoir. Thus, the possible range of scores is from 20 percent (all metrics poor) to 100 percent (all metrics good). This reservoir ecological health evaluation method is proving to be a valuable tool for providing the public with information about the condition of the Valley's reservoirs, for allowing meaningful comparisons among reservoirs, and for tracking changes in reservoir health with time.

2121 (TVA/WM–93/21) **Biomonitoring of fish communities, using the index of Biotic Integrity, as an indicator of the success of soil conservation measures in the Rabbit Creek and Middle Creek watersheds, Macon County, North Carolina.** Tennessee Valley Authority, Chattanooga, TN (United States). Aug 1993. 12p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE93040576. Source: OSTI; NTIS.

Fish communities in two upper Little Tennessee River tributaries, Rabbit Creek and Middle Creek, both located in Macon County, North Carolina, were monitored using IBI methods in 1990 and again in 1992. A single site, each on the lower reaches of its respective creek, was chosen to reflect the influence of conditions throughout the watershed and to provide a measure of water quality exiting the watershed. The Rabbit Creek watershed (Holly Springs community) has a long history of settlement and agricultural use. Dominant land uses today are pasture in the bottom lands and residential development at higher elevations. Much of the upper portion of the Middle Creek watershed on the slopes of Scaly Mountain is devoted to cabbage farming, often on steep slopes and highly erodible soils. From the cabbage growing area, the creek drops 400 feet to the lower valley. Other common land uses include residential, livestock, and forest. Both streams are characterized by heavy sedimentation and frequent high turbidity. Both streams showed marked improvement between 1990 and 1992. In 1990, Rabbit Creek's IBI score was 31.0, for a bioclass rating of "poor." In 1992, the IBI score was 42.1 for a bioclass rating of "fair." For Middle Creek, the corresponding figures and ratings are 42.1 (fair) and 54.5 (good). Examination of the data for Rabbit Creek shows a reduction in the proportion of pollution-tolerant species, a higher proportion of specialized insectivores, a higher catch rate (reflecting higher total numbers of fish), and an additional intolerant species. In both cases, the data (supported by visual observation) suggests the causative factor is reduced sedimentation.

2122 (TVA/WR–92/20) **Guntersville Reservoir Herbicide Monitoring Survey, 1990.** Rodgers, J.H. Jr.; Dunn, A.; Robison, R. Mississippi Univ., University, MS (United States). Dept. of Biology. Oct 1992. 170p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States); Department of Defense, Washington, DC (United States). Order Number DE93040423. Source: OSTI; NTIS.

The primary objective of this study was to monitor herbicide residues in water, sediment, fish, mollusks, and plant tissue in conjunction with the Tennessee Valley Authority's (TVA) aquatic plant management program of 1990 for Guntersville Reservoir. This program was initiated in response to growths of the nonnative and problematic submersed aquatic plant species, Hydrilla verticillata and Myriophyllum spicatum, and was part of a joint agency program of TVA and the US Army Corps of Engineers Waterways Experiment Station. The herbicides used during this program were fluridone, 2,4 dichlorophenoxy acetic acid (dimethylamine formulation-(2,4-D DMA)), endothall, diquat, and copper. These herbicides were applied to critical priority treatment areas (areas that were most affected by the presence of H. verticillata and M. spicatum which impaired use of the water resource) during the summer of 1990. Both pre- and post-treatment samples were collected and analyzed by University of Mississippi personnel. The

most current analytical techniques were utilized for analyses which included samples from nine area water treatment plants for potable water. Both untreated (raw) and treated (finished) water samples were analyzed.

2123 (YJT–92-27) **Groundwater chemistry at Haestholmen, Loviisa: Summary of investigations in 1980-1992.** Snellman, M. (Imatran Voima Oy, Vantaa (Finland)); Helenius, J. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Dec 1992. 101p. (In Finnish). Order Number DE94605501. Source: OSTI; NTIS; INIS.

The geochemistry of the groundwater at the nuclear waste investigation site, Haestholmen is evaluated. The hydrogeological data is collected from boreholes drilled down to 200-m depth into rapakivi granite. The interpretation is based on groundwater chemistry and isotope data of altogether 140 samples collected from 8 boreholes. Also 6 seawater samples were included.

2124 (YJT–93-09) **Groundwater chemistry of the gabbro bodies at Kivetty and Syyry.** Pitkaenen, P. (Technical Research Centre of Finland, Espoo (Finland). Road, Traffic and Geotechnical Lab.); Leino-Forsman, H.; Snellman, M. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). May 1993. 80p. (In Finnish). Order Number DE94605502. Source: OSTI; NTIS; INIS.

The geochemistry of the groundwaters from small gabbro bodies at the nuclear waste disposal investigation sites, Kivetty and Syyry in Finland are evaluated. The hydrogeological data was collected from boreholes drilled to the depth of a few meters in the crystalline bedrock. The interpretation is based on groundwater chemistry and isotope data, mineralogical data, and the structure and hydrology of the bedrock, using correlation diagrams and thermodynamic calculations (PHREEQE). The Hydrogeochemistry and major processes controlling the groundwater chemistry are discussed. The results are compared with hydrogeochemical data from the gabbro intrusions at East Bull Lake in Canada, at Taavinunnanen in Sweden and at Ylivieska, Ranua and Keminmaa in Finland.

2125 (YJT–93-10) **Interpretation of the 1989-1992 hydraulic interference tests at the five TVO sites in Finland.** Ylinen, A. (Technical Research Centre of Finland, Espoo (Finland). Road, Traffic and Geotechnical Lab.); Vaeaetaeinen, A. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Jun 1993. 185p. Order Number DE94605503. Source: OSTI; NTIS; INIS.

In 1987 Teollisuuden Voima Oy (TVO) selected five areas for preliminary site investigations for a possible used fuel repository. The five sites throughout Finland were appointed to various characterizations, among which were a number of selected hydraulic tests. The report combines and summarizes results of one type of hydraulic test procedures, namely hydraulic crosshole interference tests, carried out at each of the five sites. The aim of the tests were to learn about the hydrogeologic characteristics of the bedrock.

2126 (YJT–93-11) **Geostatistical analysis of hydrological data in five crystalline rock sites in Finland.** Niemi, A. (Technical Research Centre of Finland, Espoo (Finland). Road, Traffic and Geotechnical Lab.); Kontio, K. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Jun 1993. 64p. Order Number DE94605504. Source: OSTI; NTIS; INIS.

The report resents a geostatical analysis of the single-hole hydraulic conductivity data from the five crystalline rock sites in the preliminary site characterization program (1987-1992) for nuclear waste disposal of Teollisuuden Voima Oy (TVO-I and TVO-II reactors). The statistics for both the individual boreholes and the site data are considered. Analyses are carried out (1) for the original data sets, (2) for data from which measurements related to deterministic fracture zones have been excluded and (3) for data from which both the fracture zones and data from the more conductive upper portion of the bedrock are excluded. The robustness of the site statistics is studied by repeating the computations for subsets of the data from which one borehole at a time is excluded. Depth dependency in hydraulic conductivity is studied by dividing the data in two classes according to the depth. The data are also studied with assumptions of an underlying normal distribution. With a large number of measurements at the detection limit of the measuring equipment, special consideration is given to the proper determination of the Gaussian parameters. Confidence limits of the Gaussian parameters are determined as well. The statistical similarities and differences between various site data are studied by means of nonparametric statistical tests. The Kolmogorov-Smirnov, Wilcoxon and Kruskal-Wallis tests are employed and both data with and without fracture zones are considered.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Refer also to citation(s) 1805, 1819

5502 Biochemistry

Refer also to citation(s) 959, 1155, 2078, 2133, 2135, 2137, 2138, 2139, 2162, 2177, 2178, 2179, 2181

2127 (ANL/BIM/PP–72224) **Bence Jones proteins: Powerful tool for fundamental study of protein chemistry and pathophysiology.** Stevens, F.J. (Argonne National Lab., IL (United States)); Schiffer, M.; Solomon, A. Argonne National Lab., IL (United States). [1991]. 9p. Sponsored by USDOE, Washington, DC (United States); Department of Health and Human Services, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant CA 10056. Order Number DE93040890. Source: OSTI; NTIS; GPO Dep.

Bence Jones proteins are typically found in patients with monoclonal plasma cell or related B-cell immunoproliferative disorders. Because of their monoclonal origin and resulting chemical homogeneity much of the fundamental information on immunoglobulin structure came initially from their analysis. Amino acid analyses of these components revealed an N-terminal variable (V) and C-terminal constant (C) domain as well as the existence within the V domain of hypervariable segments that account for the specificity and diversity of antibodies. Over the past three decades, the primary structures of hundreds of light chains (complete and partial), from human and other sources, have been determined, aligned, and archived. Bence Jones proteins and V_L dimers were the crystallizable homogeneous proteins which provided much of the early three-dimensional conformational data that helped explain the structural basis of antibody function. Remarkably, a single Bence Jones protein in two solvent systems (low and high ionic strength) exhibited significant differences in the interactions of the two monomeric subunits comprising the dimer, resulting in substantial variation in the structure of the antigen combining site under the two solution conditions. This observation led to a prediction that heterogeneity of domain interactions may contribute to antibody-antigen interactions. Experimental support for this hypothesis has come from comparisons of the detailed structures of antibody-antigen complexes. The interactions at the interface of the V_L dimer are a function of primary structure and solution conditions. Study of these interactions has led to new information on the relationship between protein structure and function and, as discussed below, can account for specific pathophysiological properties associated with Bence Jones proteins.

2128 (ANL/CMB/PP–80296) **Rearrangement of RAG-1 recombinase gene in radiation-sensitive "wasted" mice.** Woloschak, G.E. (Argonne National Lab., IL (United States)); Libertin, C.R.; Weaver, P.; Churchill, M.; Chang-Liu, C.M. Argonne National Lab., IL (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040883. Source: OSTI; NTIS; INIS; GPO Dep.

Mice recessive for the autosomal gene "wasted" (wst) display a disease pattern which includes increased sensitivity to the killing effects of ionizing radiation, immunodeficiency, and neurologic dysfunction. The recent cloning and characterization of recombinase genes (RAG-1/RAG-2) expressed in lymphoid and possibly central nervous system tissues prompted us to examine expression of these genes in DNA repair-deficient/immunodeficient wasted mice. Our results revealed expression of RAG-1 mRNA in spinal cord (but not brain) of control mice; no expression of RAG-1 mRNA was

detected in spinal cord or brain from wst/wst mice or their normal littermates (wst/· mice). In thymus tissue, a small RAG-1 transcript (1.0 kb) was detected in wst/wst mice that was not evident in thymus from control mice. In wst/· mice, a two-fold increase in RAG-1 MRNA was evident in thymus tissue. RAG-2 mRNA could only be detected in thymus tissue from wst/· and not from wst/wst or parental control BCF_1 mice. Southern blots revealed a rearrangement/deletion within the RAG-1 gene of affected wasted mice, not evident in known strain-specific parental or littermate controls. These results support the idea that the RAG-1 gene may map at or near the locus for the wasted mutation. In addition, they suggest the importance of recombinase function in normal immune and central nervous system development as well as the potential contribution of this gene family to the normal repair of radiation-induced DNA damage.

2129 (BNL–49412) **Gene expression in the DpnI and DpnII restriction enzyme systems of Streptococcus pneumoniae.** Lacks, S.A.; Sabelnikov, A.G.; Chen, Jau-Der; Greenberg, B. Brookhaven National Lab., Upton, NY (United States). [1992]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9208242–1: 11. European meeting on genetic transformation, DNA transfer and gene expression in microorganisms, Budapest (Hungary), 23-27 Aug 1992). Order Number DE93041152. Source: OSTI; NTIS; GPO Dep.

Although a number of bacterial species are naturally transformable, that is, their cells are able to take up external DNA in substantial amounts and integrate it into the chromosome without artificial manipulation of the cell surface, Streptococcus pneumoniae, the first species in which this phenomenon was detected, remains a prototype of such transformation. Cells of S. pneumonias also contain potent restriction endonucleases able to severely restrict DNA introduced during viral infection. Our current understanding of the genetic basis of the complementary DpnI and DpnII restriction systems and of the biochemistry of their component enzymes are briefly reviewed. The manner in which these enzymes impinge on the transfer of chromosomal genes and of plasmeds will be examined in detail. It will be seen that far from acting against foreign DNA in general, the restriction systems seem to be designed to exclude only infecting viral DNA The presence of complementary restriction systems in different cells of S. pneumonias enhances their effectiveness in blocking viral infection and promoting species survival. This enhanced effectiveness requires the expression of alternative restriction systems. Therefore, the ability of the cells to transfer the restriction enzyme genes and to regulate their expression are important for survival of the species.

2130 (DOE/ER/20054–2) **Transposon-induced nuclear mutations that alter chloroplast gene expression: Annual report, September 1, 1992–April 15, 1993.** Barkan, A. Oregon Univ., Eugene, OR (United States). Inst. of Molecular Biology. 20 Apr 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-91ER20054. Order Number DE94001584. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to use mutant phenotypes as a guide to nuclear genes that control the timing and cell-type specificity of chloroplast gene expression. Studies are being conducted with nuclear mutants of maize that are defective in the biogenesis or translation of chloroplast mRNAs. Currently studies are focused on two nuclear mutants with specific and unique lesions in chloroplast RNA processing (crp mutants). Crp1 mutants (formerly called hcf136) fail to accumulate the cytochrome f/b6 complex. The protein loss is due to a defect in the metabolism of transcripts encoding the petB and petD gene products, two subunits of the missing complex. Mutant seedlings lack the monocistronic petB and petD MRNAS, which both arise in nominal plants by endonucleolytic cleavage of the polycistronic primary transcript of the psbB gene cluster. Precursor mRNAs accumulate normally in crp1, indicating that its defect is due either to a failure to cleave the precursors, or a failure to stabilize the fully processed mRNAs. We are interested in both the biochemistry of this site-specific RNA processing and in the role of the processing in generating translatable mRNAs. To address the latter, we are quantifying the rates of synthesis of the petB and petD gene products with the goal of determining whether the missing transcripts are more efficiently translated than their precursors. To address the biochemistry of the defect in RNA metabolism, the crp1 gene is being cloned via the transposon tag. crp2 (formerly called hcf142) lacks the predominant mRNA encoding petA, but appears to be otherwise unimpaired in chloroplast RNA metabolism. The precise role of crp2 in synthesizing or stabilizing the petA mRNA is being investigated through biochemical studies.

2131 (LA-UR–93-2936) **Conformational flexibility in biochemical regulation.** Trewhella, J. Los Alamos National Lab., NM (United States). 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9306237–1: 8. conversation in the discipline biomolecular stereodynamics, Albany, NY (United States), Jun 1993). Order Number DE93040096. Source: OSTI; NTIS; GPO Dep.

Small-angle X-ray and neutron scattering have proven extremely useful for studying the evolutionarily related dumbbell-shaped Ca^{2+} -binding proteins calmodulin and troponin C and their interactions with the target proteins whose activity they regulate. Calmodulin contracts about target enzyme binding domains with the common characteristic of having a high propensity for forming a basic, amphipathic a-helix. The contraction is achieved via flexibility in the interconnecting helix region of the molecule that links its two globular domains. This flexibility allows calmodulin to optimize its binding to different arrangements of hydrophobic and charged residues important in forming these complexes. In contrast calmodulin remains extended in its interaction with the catalytic subunit of phosphorylase kinase. There are structural and functional similarities between this interaction and that of troponin C and troponin I. Our most recent neutron scattering experiments confirm our prediction that troponin C also remains extended in this complex. The ability of the dumbbell-shaped Ca^{2+} -binding proteins to modulate their conformations via flexibility in the interconnecting helix region in order to accommodate different target binding domains is a remarkable example nature building functional diversity as well as specificity into a compact and unusual shape.

2132 (LA-UR–93-3013) **A new approach to calculate the hydration of DNA molecules.** Hummer, G. (Los Alamos National Lab., NM (United States)); Soumpasis, D.M. Los Alamos National Lab., NM (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9306237–3: 8. conversation in the discipline biomolecular stereodynamics, Albany, NY (United States), Jun 1993). Order Number DE93040130. Source: OSTI; NTIS; GPO Dep.

A new method to calculate approximate water density distributions around DNA is presented. Formal and computational simplicity are emphasized in order to allow routine hydration studies. The method is based on the application of pair and triplet correlation functions of water-oxygen calculated by computer simulation. These correlation functions are combined with the configurational data of the electronegative atoms on DNA (oxygen and nitrogen) taken from crystal structures. For three B-DNA structures water density distributions are calculated and discussed. The observed characteristic features agree well with the prevalent picture from experiments. The minor groove shows a more structured hydration than the major groove. Also, the minor groove hydration of A·T basepair tracts differs from that found in G·C basepair regions. In A·T tracts single peaks of high water density appear, whereas in G·C regions the minor groove is occupied by two side-by-side ribbons of water.

5503 Cytology

2133 (DOE/ER/61420–1) **The cell surface.** Axel, R. (Columbia Univ., New York, NY (United States)); Goodman, C.; Hynes, R.; Stillman, B. Cold Spring Harbor Lab., NY (United States). [1992]. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER61420. (CONF-9205374–Absts.: 57. Cold Spring Harbor symposium on quantitative biology: The cell surface, Cold Spring Harbor, NY (United States), 27 May - 3 jun 1992). Order Number DE93041281. Source: OSTI; NTIS; GPO Dep.

This volume contains abstracts of oral presentations and poster sessions of made at the LVII Cold Springs Symposium on Quantitative Biology, entitled The Cell Surface.

2134 (ETDE-IT–93-237) **Infrared parameters in characterization of the neoplastic cell transformation.** Mauro, F. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Teodori, L.; Trinca, M.L.; Papineschi, F.; Benedetti, E.; Spremolla, G.; Vergamini, P. 1992. 11p. Order Number DE94716572. Source: OSTI; NTIS (US Sales Only).

This paper reports the results on the characterization of neoplastic cells by means of FT-IR spectroscopy. Spectral differences were found in examining normal and leukemic lymphocytes. Through analyzing also nuclei extracted from normal and leukemic lymphocytes, an increase of DNA with respect to proteic components was observed in the order: normal lymphocytes, leukemic lymphocytes, normal nuclei, and leukemic nuclei. Spectral differences were observed between lipids extracted from normal and leukemic cells. Recently, the infrared spectra of single normal and leukemic cells were obtained. The later point opens up new possibilities in revealing the early phase of the disease, in following the trends of leukemia in patients who are under treatment with drugs, and in evaluating the residual neoplastic disease. This research was extended to the study of human tumor lung cells. Spectral differences were also observed analyzing normal and neoplastic cells. Spectroscopic parameters distinguishing normal from tumoral cells were suggested.

5504 Genetics

Refer also to citation(s) 1370, 2161, 2162, 2181

2135 (ANL/CMB/PP–80478) **Identification of a mutational site in exon VI of the mouse p53 gene.** Paunesku, T.; Gemmell, M.A.; Crkvenjakov, R.; Woloschak, G.E. Argonne National Lab., IL (United States). Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001299. Source: OSTI; NTIS; GPO Dep.

Sequencing by hybridization techniques are being used to analyze the incidence of specific p53 mutations associated with radiation-induced and spontaneous lymphosarcomas in mice. One sequence difference noted as being a mouse strain-specific polymorphism has been identified through these experiments as being a mutational, rather than a polymorphic, site.

2136 (ANL/MCS/CP–80305) **Applications of the Aurora parallel Prolog system to computational molecular biology.** Lusk, E.L. (Argonne National Lab., IL (United States)); Overbeek, R.; Mudambi, S.; Szeredi, P. Argonne National Lab., IL (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310172–1: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE93041166. Source: OSTI; NTIS; GPO Dep.

We describe an investigation into the use of the Aurora parallel Prolog system in two applications within the area of computational molecular biology. The computational requirements were large, due to the nature of the applications, and were large, due to the nature of the applications, and were carried out on a scalable parallel computer the BBN "Butterfly" TC-2000. Results include both a demonstration that logic programming can be effective in the context of demanding applications on large-scale parallel machines, and some insights into parallel programming in Prolog.

2137 (LA-UR–93-2827) **Modeling the connection between development and evolution: Preliminary report.** Mjolsness, E. (Yale Univ., New Haven, CT (United States)); Reinitz, J.; Garrett, C.D.; Sharp, D.H. Los Alamos National Lab., NM (United States). 29 Jul 1993. 19p. Sponsored by Department of Health and Human Services, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant LM 07056;RR 07801;88-0240. (CONF-9306236–1: Monterey bio-computations conference, Monterey, CA (United States), 21-28 Jun 1993). Order Number DE93040260. Source: OSTI; NTIS; GPO Dep.

In this paper we outline a model which incorporates development processes into an evolutionary frame work. The model consists of three sectors describing development, genetics, and the selective environment. The formulation of models governing each sector uses dynamical grammars to describe processes in which state variables evolve in a quantitative fashion, and the number and type of participating biological entities can change. This program has previously been elaborated for development. Its extension to the other sectors of the model is discussed here and forms the basis for further approximations. A specific implementation of these ideas is described for an idealized model of the evolution of a multicellular organism. While this model doe not describe an actual biological system, it illustrates the interplay of development and evolution. Preliminary results of numerical simulations of this idealized model are presented.

2138 (LBL–33745) **Lipoprotein subclasses in genetic studies: The Berkeley Data Set.** Krauss, R.M. (Lawrence Berkeley Lab., CA (United States)); Williams, P.T.; Blanche, P.J.; Cavanaugh, A.; Holl, L.G.; Austin, M.A. Lawrence Berkeley Lab., CA (United States). Oct 1992. 17p. Sponsored by USDOE, Washington, DC (United States); Department of Health and Human Services, Washington, DC (United States); National Dairy Council, Rosemont, IL (United States). DOE Contract AC03-76SF00098. Grant HL 18574. (CONF-9211266–1: 1992 annual meeting of the American Society of Human Genetics (ASHG), San Francisco, CA (United States), 6-14 Nov 1992). Order Number DE93040643. Source: OSTI; NTIS; GPO Dep.

Data from the Berkeley Data Set was used to investigate familial correlations of HDL-subclasses. Analysis of the sibling intraclass correlation coefficient by HDL particle diameter showed that sibling HDL levels were significantly correlated for HDL_{2b}, HDL_{3a} and HDL_{3b} subclasses. The percentage of the offsprings' variance explained by their two parents. Our finding that parents and offspring-have the highest correlation for HDL_{2b} is consistent with published reports that show higher heritability estimates for HDL_2 compared with HDL_3 – cholesterol.

2139 (ORNL–6757) **Biology Division progress report, October 1, 1991–September 30, 1993.** Hartman, F.C.; Cook, J.S. Oak Ridge National Lab., TN (United States). Oct 1993. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001018. Source: OSTI; NTIS; GPO Dep.

This Progress Report summarizes the research endeavors of the Biology Division of the Oak Ridge National Laboratory during the period October 1, 1991, through September 30, 1993. The report is structured to provide descriptions of current activities and accomplishments in each of the Division's major organizational units. Lists of information to convey the entire scope of the Division's activities are compiled at the end of the report.

5505 Metabolism

Refer also to citation(s) 70, 1979, 2078, 2242

5506 Medicine

Refer also to citation(s) 1216, 1528, 1625, 1637, 2161, 2168, 2170, 2172, 2201, 2203

2140 (BNL–49524) **Conceptual design of an 8 Tesla superconducting wiggler for a dedicated digital subtraction angiography source.** Blum, E.B. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94002544. Source: OSTI; NTIS; INIS; GPO Dep.

One of the most important techniques used to diagnose heart disease is coronary angiography. Coronary angiography is only used when it is absolutely essential because of the risk of fatalities and other serious complications arising from the insertion of the catheter. The technique also exposes the patients to large amounts of x-rays. Research, begun at SSRL and continued on the X17 beam line at NSLS, demonstrated the feasibility of imaging human coronary arteries following venous injection of the contrast agent.

The technique, caged digital subtraction angiography (DSA), uses two monochromatic beams of x-rays, one slightly above and one slightly below the iodine K absorption edge (33.169 KeV) to collect simultaneous images. When the two images are subtracted, the contrast agent, contained primarily in the blood vessels, is revealed and the background that is common to both images is suppressed. The images must be collected during a single heartbeat to avoid blurring from motion of the blood vessels. Conventional x-ray sources are too weak to provide the intense flux that is required in the narrow energy bandwidth of the beams. Only the most powerful synchrotron radiation beams from wiggler magnet sources can provide the intensity required in the short exposure time. Although DSA experiments have shown promise, they have been conducted at large, research synchrotron radiation facilities. A small, dedicated source will be needed before DSA can be used as a standard medical procedure. Such x-ray sources as laser backscattering, Cherenkov radiation, parametric x-radiation, and channeling radiation have been suggested for hospital based DSA sources but none of them appear to produce enough flux to be useful. Barring the discovery of a new source of intense x-rays, only synchrotron radiation seems to meet the requirements for DSA. This report briefly describes the preliminary design of a high field, superconducting wiggler magnet that can be used as a DSA source.

2141 (CONF-9302119–2) **Influence of revascularization on myocardial perfusion, metabolism and function evaluated with I-123-IPPA.** Kropp, J. (Bonn Univ. (Germany)); Krois, M.; Eichhorn, B.; Feske, W.; Likungu, J.; Kirchhoff, P.J.; Luederitz, B.; Biersack, H.J.; Knapp, F.F. Jr. Oak Ridge National Lab., TN (United States). [1993]. 27p. Sponsored by USDOE, Washington, DC (United States); North Atlantic Treaty Organization, Brussels (Belgium); Alexander von Humboldt-Stiftung, Bonn (Germany). DOE Contract AC05-84OR21400. Grant CRG 900966. From 3. international symposium on radioiodinated fatty acids; Kyoto (Japan); 10-11 Feb 1993. Order Number DE94000491. Source: OSTI; NTIS; INIS; GPO Dep.

Patients with coronary artery disease (CAD) were investigated with sequential SPECT-scintigraphy after administration of 200 MBq of 15-(p-[I-123]iodophenyl)pentadecanoic acid (IPPA) at peak submaximal exercise. Twenty patients underwent coronary angioplasty (PTCA) from which 14 had control coronary arteriography (CA) and left ventricular cineventriculography (LVCV). Nineteen pts underwent bypass graft surgery (ACB) and stress sonagraphy. Semi-quantification of uptake (Up related to perfusion) and turnover (Tr) was obtained by segmental comparison of oblique slices. About 90% of the reperfused myocardial segments in the PTCA-group and 76% in the ACB-group showed an improvement of uptake after therapy (RUp). Of these, 50% and 66% exhibited increased turnover (RTr) after PTCA or ACB. Pathologic RTr was highly correlated with regional wall motion abnormalities after therapy in both groups. In the ACB-group presence of improvement of RTr was correlated with improved RWM at rest and stress. IPPA-studies show potential to provide information about changes of perfusion and metabolism after reperfusion and IPPA-turnover is a good predictor of the pattern of contractile function.

2142 (INIS-BR–3148) **Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.** Costa, E.T.; Martins, H.L.; Muehlen, S.S.; Rockman, T.M.B. (eds.). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

This 1. National Forum of Science and Technology on Health presents works of several scientific institutions, including topics on bioengineering; modelling and simulation; sensors and transducers; ultrasonic on medicine; instrumentation processing of signs and medical images; biomedical informatics and clinical software; engineering of rehabilitation; bio-materials and bio-mechanical; clinical engineering; in vivo and in vitro nuclear medicine; radioisotope production and utilization; radiology; radiology protection and dosimetry; radiotherapy; evaluation of technology on health and education. (C.G.C.).

2143 (INIS-BR–3148, pp. 158-161) **Hardware and software for image acquisition in nuclear medicine.** Fideles, E.L. (Paraiba Univ., Joao Pessoa, PB (Brazil)); Vilar, G.; Silva, H.S. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A system for image acquisition and processing in nuclear medicine is presented, including the hardware and software referring to acquisition. The hardware is consisted of an analog-digital conversion card, developed in wire-wape. Its function is digitate the analogic signs provided by gamma camera. The acquisitions are made in list or frame mode. (C.G.C.).

2144 (INIS-BR–3148, pp. 284-287) **Validation study of linear distance measurements from CT scans using a multiplanar reformatting system.** Goncalves, R.J. (BioMetrix Technologies, Inc., Philadelphia, PA (United States)); Roberts, D.; Lotufo, R.A. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The work reported here is a validation study of linear distance measurements based on images obtained from CT scanners and post-processed by an off-line multiplanar-reformatting system. It discusses some of the problems and shows how such a system can yield more accurate measurements than utilizing just the scanner console. (author).

2145 (INIS-BR–3148, pp. 292-294) **Evaluation of three acquisition modes for radionuclide ventriculography.** Abe, R. (Sao Paulo Univ., SP (Brazil). Faculdade de Medicina); Monteiro, H.; Oliveira, M.A.; Pereira, S.S.; Robilotta, C.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A comparative study, in vivo, of three acquisition modes (forward, backward and forward-backward by thirds) for radionuclide ventriculography is described, including some results. (C.G.C.).

2146 (INIS-BR–3148, pp. 298-301) **Comparison of tomography reconstruction by maximum entropy and filtered retro**

projection. Abdala, F.J.P. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia); Simpson, D.M.; Roberty, N.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The tomographic reconstruction with few projections is studied, comparing the maximum entropy method with filtered retro projection. Simulations with and without the presence of noise and also with the presence of an object of high density inside of the skull are showed. (C.G.C.).

2147 (INIS-BR--3148, pp. 302-305) **Geometrical efficiency in computerized tomography: generalized model.** Costa, P.R. (Sao Paulo Univ., SP (Brazil). Servico Tecnico de Eletronica Hospitalar); Robilotta, C.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

A simplified model for producing sensitivity and exposure profiles in computerized tomographic system was recently developed allowing the forecast of profiles behaviour in the rotation center of the system. The generalization of this model for some point of the image plane was described, and the geometrical efficiency could be evaluated. (C.G.C.).

2148 (INIS-BR--3148, pp. 309-312) **Study of Compton scattering influence in cardiac SPECT images.** Munhoz, A.C.L. (Sao Paulo Univ., SP (Brazil). Faculdade de Medicina); Abe, R.; Zanardo, E.L.; Robilotta, C.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The reduction effect from Compton fraction in the quality of and image is evaluated, with two ways of acquisition data: one, with the window of energetic analyser dislocated over the photopeak and the other, with two windows, one over the Compton contribution and the other, placed in the center over the photopeak. (C.G.C.).

2149 (INIS-BR--3148, pp. 313-315) **Images compression in nuclear medicine.** Rebelo, M.S. (Sao Paulo Univ., SP (Brazil). Faculdade de Medicina); Furuie, S.S.; Moura, L. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The performance of two methods for images compression in nuclear medicine was evaluated. The LZW precise, and Cosine Transformed, approximate, methods were analyzed. The results were obtained, showing that the utilization of approximated method produced images with an agreeable quality for visual analysis and compression rates, considerably high than precise method. (C.G.C.).

2150 (INIS-BR--3148, pp. 427-430) **Study of detection probability from lesion by scintiscanning.** Silva, D.C. da (Sao Paulo Univ., SP (Brazil). Centro de Medicina Nuclear); Dias-Neto, A.L. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The importance of work with the information density parameter in scintiscanning is described, fixing the minimum values of information density, above of which the existent injuries are not detected, allowing also the reproducibility of the examination. (C.G.C.).

2151 (INIS-BR--3148, pp. 431-433) **Mathematic filters and digital processing in nuclear medicine.** Dimentein, R. (Hospital Israelita Albert Einstein, Sao Paulo, SP (Brazil)). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The mathematic filters used in nuclear medicine were evaluated. Tomographic processing of a Jaszczak phantom, using separately Hanning, Butterworth and Wiener filters were presented. For each type of filter were made simulation, where the cut frequency and extenuation grade values were changed. (C.G.C.).

2152 (INIS-BR--3148, pp. 431-433) **Mathematic filters and digital processing in nuclear medicine.** Malvestiti, L.F. (Sao Paulo Univ., Ribeirao Preto, SP (Brazil). Faculdade de Filosofia, Ciencias e Letras); Ghilardi Netto, T.; Braga, F.J.H.N.; Iagizi, N. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275--: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Radio aerosols and ventilation scintigraphy have a well-defined role in nuclear medicine practice. Studies of alveolar-capillary

clearance of technetium-99 m diethylene triamine penta-acetic acid (99 mTc-DTPA) allow early presumptive diagnosis of opportunistic lung infections with higher sensitivity than conventional methods. A computer program to process the acquired images, which leads to a fast and efficient way to quantity the alveolar-capillary clearance is developed. (author).

2153 (INIS-BR–3148, pp. 440-443) **Implementation of a national detection plan of neonatal hypothyroidism. First year of experience from population sample.** Aznarez, A. (Centro de Investigaciones Nucleares, Montevideo (Uruguay). Facultad de Ciencias); Balter, H.; Giambruno, G. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Spanish). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The experience of the first year of development from a detection program of congenital hypothyroidism is presented. The radioimmunoassay of TSH from heel capillary blood, obtained before the discharge of new-born baby in two obstetrics assistance centers of Medicine Faculty is also studied. (C.G.C.).

2154 (INIS-BR–3148, pp. 497-499) **Quality evaluation of mammography systems: identification of the best region by the transfer function method.** Schiabel, H. (Sao Paulo Univ., Sao Carlos, SP (Brazil). Escola de Engenharia); Frere, A.F. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The evaluation of mammography systems behaviour, using the conventional analysis method of transfer function is discussed. An investigation for evaluating the behaviour of modulation transfer function on several direction of orifices in the radiation field is also presented. (C.G.C.).

2155 (INIS-BR–3148, pp. 622-625) **Proposal of a research and development program for cerebral tumor treatment by neutron capture.** Silva, M.M. da (Coordenadoria para Projetos Especiais (COPESP), Sao Paulo, SP (Brazil)). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The researches related to the Boron Neutron Capture Therapy, that were developed at Nuclear Energetic Institute (IPEN/CNEN-SP) and the Coordination for Special Projects (COPESP) are described. A coordinate development program is presented for constructing of an installation, with the purpose of routine utilization of this technique. (C.G.C.).

2156 (INIS-mf–13731, pp. 324) **Estimate of the absorbed dose due to the ^{20}Ne beam with the energy of 77.1 MeV/nucleon and its fragments formed in interactions with water and plexiglas.** Borcea, C. (IFA, Magurele-Bucharest (Romania)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEON 20 BEAMS/radiation doses; NEON 20 BEAMS/tissue-equivalent materials; NUCLEAR FRAGMENTS/radiation doses; DIELECTRIC TRACK DETECTORS; PLEXIGLAS; RADIOTHERAPY; WATER

2157 (LA-UR–93-2901) **Mechanical design parameters for detection of nuclear signals by magnetic resonance force microscopy.** Moore, G.J. (Los Alamos National Lab., NM (United States)); Hanlon, J.A.; Lamartine, B.; Hawley, M.; Solem, J.C.; Signer, S.; Jarmer, J.J.; Penttila, S.; Sillerud, L.O.; Pryputniewicz, R.J. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308138–3: 11. international invitational symposium on the unification of analytical, computational, and experimental solution methodologies, Danvers, MA (United States), 18-20 Aug 1993). Order Number DE94000810. Source: OSTI; NTIS; INIS; GPO Dep.

Recent theoretical work has shown that mechanical detection of magnetic resonance from a single nuclear spin is in principle possible. This theory has recently been experimentally validated by the mechanical detection of electron spin resonance signals using microscale cantilevers. Currently we are extending this technology in an attempt to detect nuclear signals which are extending this technology in an attempt to detect nuclear signals which are three orders of magnitude lower in intensity than electron signals. In order to achieve the needed thousand-fold improvement in sensitivity we have undertaken the development of optimized mechanical cantilevers and highly polarized samples. Finite element modeling is used as a tool to simulate cantilever beam dynamics and to optimize the mechanical properties including Q, resonant frequency, amplitude of vibration and spring constant. Simulations are compared to experiments using heterodyne hologram interferometry. Nanofabrication of optimized cantilevers via ion milling will be directed by the outcome of these simulations and experiments. Highly polarized samples are developed using a three-fold approach: (1) high magnetic field strength (2.5T), (2) low temperature (1K), and (3) use of samples polarized by dynamic nuclear polarization. Our recent experiments have demonstrated nuclear polarizations in excess of 50% in molecules of toulene.

2158 (LA-UR–93-2983) **Particle therapy.** Raju, M.R. Los Alamos National Lab., NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308166–1: 2. international summer school on physics in radiotherapy, Warsaw (Poland), 26 Aug - 3 sep 1993). Order Number DE93040124. Source: OSTI; NTIS; INIS; GPO Dep.

Particle therapy has a long history. The experimentation with particles for their therapeutic application got started soon after they were produced in the laboratory. Physicists played a major role in proposing the potential applications in radiotherapy as well as in the development of particle therapy. A brief review of the current status of particle radiotherapy with some historical perspective is presented and specific contributions made by physicists will be pointed out wherever appropriate. The rationale of using particles in cancer treatment is to reduce the treatment volume to the target volume by using precise dose distributions in three dimensions by using particles such as protons and to improve the differential effects on tumors compared to normal tissues by using high-LET radiations such as neutrons. Pions and heavy ions combine the above two characteristics.

2159 (STUK-A–111) **Magnetic resonance imaging equipments: Their use and safety in Finland 1993.** Huurto, L.; Jokela, K.; Servomaa, A. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jul 1993. 70p. (In Finnish). Order Number DE94605709. Source: OSTI; NTIS; INIS.

Magnetic resonance imaging (MRI) is a new examination technique used in diagnostic medicine. Its use has increased notably during the last few years in Finland, too. The biological effects of electromagnetic fields used in MRI are quite different from the effects of x-rays. This report introduces the physics and the techniques of MRI; the biological effects of magnetic fields and the hazards associated with the use of MRI systems are briefly discussed. The major national and international recommendations are summarized, too. Furthermore, a description is given how safety aspects are considered in Finnish MRI units. Finally, recommendations are given to restrict the exposure caused by MRI and to ensure the safe use of MRI. Diagnostic applications and clinical or economic aspects fall outside the scope of this report. (orig.).

2160 (UCRL-ID–113760-Rev.1) **Signal processing of Shiley heart valve data for fracture detection.** Mullenhoff, C. Lawrence Livermore National Lab., CA (United States). 1 Sep 1993. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001707. Source: OSTI; NTIS; GPO Dep.

Given digital acoustic data emanating from the heart sounds of the beating heart measured from laboratory sheep with implanted Bjoerk-Shiley Convexo-Concave heart valves, it is possible to detect and extract the opening and closing heart beats from the data. Once extracted, spectral or other information can then obtained from the heartbeats and passed on to feature extraction algorithms, neural networks, or pattern recognizers so that the valve condition, either fractured or intact, may be determined.

5507 Microbiology

Refer also to citation(s) 22, 70, 1979, 2129

5509 Pathology

Refer also to citation(s) 2127, 2138, 2140, 2238

2161 (ANL/CMB/PP–73969) **Subnormal albumin gene expression is associated with weight loss in immunodeficient/DNA-repair-deficient wasted mice.** Libertin, C.R. (Loyola Univ., Maywood, IL (United States). Stritch School of Medicine); Weaver, P.; Woloschak, G.E.; Mobarhan, S. Argonne National Lab., IL (United States). [1993]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040840. Source: OSTI; NTIS; GPO Dep.

Mice bearing the autosomal recessive mutation wst express a disease syndrome of immunodeficiency, neurologic dysfunction, and increased sensitivity to the killing effects of ionizing radiation. The mice were originally characterized as "wasted" because of their dramatic weight loss that begins at 21 days of age and progresses until death at 28-32 days of age. Because of the reported association between abnormal liver status and weight loss, we examined expression of a variety of liver-specific genes in wst/wst 10 mice relative to littermate (wst/·) and parental strain (BCF_1) controls. Interestingly, the results revealed a greater than 67% reduction in albumin mRNA expression in livers derived from wst/wst mice relative to both controls. Expression of alpha-fetoprotein as well as a variety of other liver-specific genes (secretory component, metallothionein, cytochrome P_1450, transferrin receptor, tumor necrosis factor, and Ia antigen) was unaffected. These results suggest a relationship between low albumin expression and wasting syndromes in mice. In addition, we believe that our data suggest the wasted mouse as a unique model for subnormal albumin expression in humans.

2162 (DOE/ER/60408–5) **Correlation of chromosome patterns in human leukemic cells with exposure to chemicals and/or radiation: Progress report, July 1992–August 1993.** Rowley, J.D. Chicago Univ., IL (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER60408. Order Number DE94001053. Source: OSTI; NTIS; GPO Dep.

Progress in identification of chromosomal transformations associated with leukemogenesis is described. In particular progress in DNA cloning of chromosomal break points in human cancer patients is described.

2163 (DOE/ER/61442–1) **Genetics and molecular biology of breast cancer.** King, M.C. (California Univ., Berkeley, CA (United States)); Lippman, M. Cold Spring Harbor Lab., NY (United States). [1992]. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER61442. (CONF-9209408–Absts.: Genetics and molecular biology of breast cancer symposium, Cold Spring Harbor, NY (United States), 2-6 Sep 1992). Order Number DE93041280. Source: OSTI; NTIS; GPO Dep.

This volume contains the abstracts of oral presentations and poster sessions presented at the Cold Springs Harbor Meeting on Cancer Cells, this meeting entitled Genetics and Molecular Biology of Breast Cancer.

2164 (LBL–34127) **Effects of hormones on lipids and lipoproteins.** Krauss, R.M. Lawrence Berkeley Lab., CA (United States). Dec 1991. 26p. Sponsored by USDOE, Washington, DC (United States); Department of Health and Human Services, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant HL-18574. (CONF-9201162–1: Cardiovascular health and disease in women conference, Bethesda, MD (United States), 22-24 Jan 1992). Order Number DE93040644. Source: OSTI; NTIS; GPO Dep.

Levels of plasma lipids and lipoproteins are strong predictors for the development of atherosclerotic cardiovascular disease in postmenopausal women. In women, as in men, numerous factors contribute to variations in plasma lipoproteins that may affect cardiovascular disease risk. These include age, dietary components, adiposity, genetic traits, and hormonal changes. Each of these factors may operate to varying degrees in determining changes in plasma lipoprotein profiles accompanying menopause- Cross-sectional and longitudinal studies have suggested increases in levels of cholesterol, low density lipoproteins (LDL) and triglyceride-rich lipoproteins associated with menopause. High density lipoproteins (HDL), which are higher in women than men and are thought to contribute to relative protection of premenopausal women from cardiovascular disease, remain relatively constant in the years following menopause, although small, and perhaps transient reductions in the HDL_2 subfraction have been reported in relation to reduced estradiol level following menopause. Despite these associations, it has been difficult to determine the role of endogenous hormones in influencing the plasma lipoproteins of postmenopausal women. In principle, the effects of hormone replacement should act to reverse any alterations in lipoprotein metabolism that are due to postmenopausal hormone changes. While there may be beneficial effects on lipoproteins, hormone treatment does not restore a premenopausal lipoprotein profile. Furthermore, it is not dear to what extent exogenous hormone-induced lipoprotein changes contribute to the reduced incidence of cardiovascular disease with hormone replacement therapy.

5520 Public Health

Refer also to citation(s) 2164

2165 (BNL–49434) **Health risks in perspective: Judging health risks of energy technologies.** Rowe, M.D. Brookhaven National Lab., Upton, NY (United States). 18 Sep 1992. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94001489. Source: OSTI; NTIS; GPO Dep.

Almost daily, Americans receive reports from the mass news media about some new and frightening risk to health and welfare. Most such reports emphasize the newsworthiness of the risks – the possibility of a crisis, disagreements among experts, how things happened, who is responsible for fixing them, how much will it cost, conflict among parties involved, etc. As a rule, the magnitudes of the risks, or the difficulty of estimating those magnitudes, have limited newsworthiness, and so they are not mentioned. Because of this emphasis in the news media, most people outside the risk assessment community must judge the relative significance

of the various risks to which we all are exposed with only that information deemed newsworthy by reporters. This information is biased and shows risks in isolation. There is no basis for understanding and comparing the relative importance of risks among themselves, or for comparing one risk, perhaps a new or newly-discovered one, in the field of all risks. The purpose of this report is to provide perspective on the various risks to which we are routinely exposed. It serves as a basis for understanding the meaning of quantitative risk estimates and for comparing new or newly-discovered risks with other, better-understood risks. Specific emphasis is placed on health risks of energy technologies.

5530 Agriculture and Food Technology

Refer also to citation(s) 498, 926

2166 (CNIC–00636) **Fuzzy clustering analysis for the varietal radiosensitivity of triticum aestivum L.** Feng Zhijie (Inst. for Appliction of Atomic Energy, CAAS, Beijing (China)); Wang Linqing. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 13p. (CSNAS–0059.). Order Number DE94604390. Source: OSTI; NTIS (US Sales Only); INIS.

Fussy clustering classification to the varietal radiosensitivity of wheat (Triticum aestivum L.) was carried out. According to their response to the radiation of gamma rays, 49 wheat varieties were classified into five groups: higher resistant, resistant, intermediate response, sensitive, and higher sensitive. The research presents a new approach for the classification of the varietal radiosensitivity of a certain plant species, and the result was valuable for choosing the adequate irradiated materials and determining the optimal dosage so as to enhance the mutagenic efficiency in wheat radiation breeding. The reliability and advantage of the Fussy clustering classification for the plant varietal radiosensitivity were briefly discussed.

2167 (CNIC–00663) **Evaluation for dinitrogen fixation of alfalfa in field based on $\delta^{15}N$ value.** Yao Yunyin (Inst. for Application of Atomic Energy, CAAS, Beijing (China)); Chen Ming; Zhang Xizhong. China Nuclear Information Centre, Beijing, BJ (China). Dec 1992. 16p. (CSNAS–0062.). Order Number DE94604391. Source: OSTI; NTIS (US Sales Only); INIS.

The dinitrogen fixation rate of alfalfa was estimated grown in pot and field experiments. β values (isotope fraction factor) of 7 cultivars of alfalfa (Medicago sativa L.) and white clover (Trifolium repens L.) grown in N-free liquid culture medium were examined. Variations in the $\delta^{15}N$ values of varieties of alfalfa at growing seasons and forage grasses grown under various conditions were measured. %Ndfa of alfalfa was estimated using the natural ^{15}N abundance method, ^{15}N isotope dilution method and total N difference, and their accuracy was compared.

2168 (CNIC–00674) **Detection of plasma granule membrane protein (GMP-140) using radiolabelled monoclonal antibodies in thrombotic diseases.** Wu Guoxin (Suzhou Medical Coll., JS (China)); Li Fugang; Li Peixia; Ruan Changgeng. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 11p. (SMC–0085.). Order Number DE94604428. Source: OSTI; NTIS (US Sales Only); INIS.

Radioimmunoassay with two monoclonal antibodies to granule membrane protein (GMP-140) is used to determine whether plasma GMP-140 including its soluble and microparticle forms can be detected in patients with acute myocardial infarction (AMI) or during cardio-pulmonary bypass (CPB) and in platelet concentrates during storage. Monoclonal antibody (McAb) SZ-51 was used as a solid phase and ^{125}I-labelled McAb S12 was used as a fluid phase. The assay showed sufficient sensitivity to detect as few as 1 ng/mL of purified GMP-140. There was only 10.0 ± 4.5 ng/mL in normal plasma (n 20) with no significant different between the male and the female controls. Ten patients undergoing CPB demonstrated a transient increase in the concentration of plasma GMP-140, especially 2 h after CPB, and its plasma level was inversely correlated with the platelet counting during bypass (r -0.81, $P < 0.01$). Patients with AMI (n = 16) were found to have significantly increased concentration of plasma GMP-140 after AMI, reaching the peak within 3 days and changing with the progression of AMI. The concentration of plasma GMP-140 increased progressively in platelet concentrates during storage, particularly 5 days after storage. In short, these data suggest that plasma GMP-140 can be reliably detected by radioimmunoassay with two McAbs to GMP-140 and its plasma level may serve as a useful marker of thrombosis and thrombotic diseases.

2169 (CNIC–00681) **Effects of sodium chloride on radiation protection and modification of gamma-ray treated rice seeds.** Wang Cailian (Zhejiang Academy of Agricultural Sciences, Hangzhu (China). Inst. for application of Atomic Energy); Zhao Kongnan; Shen Mei; Xu Gang; Chen Qiufang. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 10p. (In Chinese). (CSNAS–0064.). Order Number DE94604392. Source: OSTI; NTIS (US Sales Only); INIS.

The radiation protection effect of sodium chloride on dormant and germinating rice seeds treated with gamma-rays, and modification effect of sodium chloride on mutation were studied. Results show that the radiation-damage effect on seedling growth, percentage of seedling growth, percentage of seedling growth and fertility in M_1 generation is significantly enhanced with the increasing of dose. However, the seedling growth, percentage of seedling growth and fertility can be improved if the irradiated seeds are pretreated with sodium chloride solution having concentrations of 0.05, 0.10 and 0.20 mol/L. The difference between treated group and control group is very significant. Results also show that pretreatment and post-treatment by sodium chloride can raise the mutation frequencies of chlorophyll deficient seedlings, especially, the mutation frequency of early heading date and height is more considerably. The conclusion is that the sodium chloride, as a radiation protection agent, combined with gamma-ray treatment could reduce the effect of radiation-damage on M_1 generation and raise the mutation frequency in M_2 generation, and this result will be helpful in rice breeding.

2170 (CNIC–00684) **Change of platelet functions during cardiopulmonary bypass.** Wu Guoxin (Suzhou Medical Coll., JS (China)); Li Jianyong; Ma Haitao; Ruan Changgeng. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 7p. (In Chinese). (SMC–0086.). Order Number DE94604429. Source: OSTI; NTIS (US Sales Only); INIS.

For observing the activation degree of platelets during various stages of cardiopulmonary bypass (CPB), a monoclonal antibody SZ-51 specific for an α-granule membrane protein (GMP-140) on the surface of activated human platelets was used. The number of platelets fell significantly during CPB and went to minimum at the end of CPB. The GMP-140 molecules on the platelet surface remarkably increased at the start of CPB, then reached to maximum between the ending of CPB and administration of protamine, and returned to normal 2 hours post-operation. However, after ending of CPB the concentration of GMP-140 in plasma began to increase, 2 hours post-operation reached to peak and 24 to 48 hours after ending CPB returned to normal. The TxB_2 in plasma reached the first peak after heparinization and start of CPB, the second peak was in the end of CPB and after administration of protamine, and returned to normal 2 hours post-operation. But the 6-keto-$PGF_{1\alpha}$ did not change very much. The concentration of PF_4 increased at the start of CPB reached to peak at the end of CPB and became normal 24 hours post-operation. The vWF increased at the start of CPB and reached to peak at the ending of CPB, then returned to normal 24 hours post-operation. These results could explain the activation degree of platelets during CPB.

2171 (IAEA/UNDP–INS/88/013-12) **Agricultural production - Phase 2. Indonesia. Controlled release pesticide formulations: Technical report. Report prepared for the Government of the Republic of Indonesia.** Vollner, L. (Gesellschaft fuer Strahlen- und Umweltforschung mbH Muenchen, Neuherberg (Germany)). International Atomic Energy Agency, Vienna (Austria); United Nations Development Programme. 1991. 14p. Project INS/88/013;INS/5/021. Order Number DE94604398. Source: OSTI; NTIS (US Sales Only); INIS.

At the request of the Government of Indonesia, an IAEA expert undertook a two weeks (of one month) mission from 2 to 15 April 1991 to the Center for Application of Isotopes and Radiation

(CAIR) of BATAN in Jakarta. Expert held a seminar, discussed and carried out experiments on Controlled Release Formulations (CRF). Discussed further experiments, cleaned and reinstalled an ECD of the Shimadzu gas chromatograph and optimized the analytical conditions for chlorinated pesticides. He also developed a project for possible submission to the Government of Germany, to allow the staff of CAIR to undertake a more intensive research and to be able to set up training facilities in his research center in Munich/Germany. He furthermore assessed needs for supply of instruments, accessories and radiolabelled pesticides. An agreement for continuing the scientific and technical mission was obtained with the staff of CAIR, in connection with the DDT-RCM at the end of November 1991, provided approval by IAEA.

2172 (INIS-BR–3148, pp. 464-466) **Isolation and purification of G immunoglobulin from guinea-pig for the production of a second antibody for radioimmunoassay.** Silva, S.R. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Borghi, V.C.; Bellini, M.H.; Wajchenberg, W.A.J. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The IgG of guinea-pig was isolated and purified by precipitation with caprylic acid and the batch absorption with DEAE-cellulose. The efficiency of the operating was verified by the determination of total proteins, during the purification stages. The purity of the end product was proved by immuno electrophoresis face to rabbit serum total antiserum of guinea-pig. it was obtained 240 mg of purity IgG to be used in the production of second specific antibody for radioimmunoassay. (C.G.C.).

2173 (INIS-BR–3172) **Formation and bio release of bound residues of [^{14} C]-lindane and [^{14} C]-parathion in two Brazilian soils.** Andrea, M.M. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1992. 141p. (In Portuguese). Order Number DE94605591. Source: OSTI; NTIS (US Sales Only); INIS.

This work studied the extractable and bound residues formation of ^{14} C-lindane and ^{14} C-parathion immediately after application and after 3 months of interaction of the pesticides with the soils. Metabolism, bio release, and the possible bioavailability of bound residues were studied by employing bio meter flasks which allowed a relative comparison of the behaviour of the two different ^{14} C-pesticides, by a balance of the applied or present radiocarbon in the soils after the bio tests. (author).

2174 (INIS-mf–13719) **Induced mutations in ornamental plants by 'In vitro' irradiation of Petunia hybrida meristems.** Gonzalez-Jimenez, J. Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Ciencias. 1993. 140p. (In Spanish). Order Number DE94604393. Source: OSTI; NTIS (US Sales Only); INIS.

In recent decades it has been observed that for the induction of mutation in ornamental plants we can obtain better results when the plants are irradiated in vegetative state and even better 'in vitro' that when its are irradiated 'in vivo'. In this work the possibilities are showed to avoid the best use of a new biotechnology: the gamma irradiations on the meristem 'in vitro'. A tissue culture method was described for the best vegetative propagation of Petunia hybrid hort through morphogenesis induction of meristem. These were planted in the Murashige and Skoog's basic medium added with BAP and ANA. The pH was adjusted to 6.5 prior autoclaving at 121 Centigrade degree and 1.1 Kg/cm^2 for 15 minutes. Latter the meristem of plantules in immature and mature physiology stated were irradiated with gamma ray doses ranging from 1.0 at 10.0 Gy. The meristem were then subcultived aseptically with the following results: (1) The immature stage was higher radio sensibilities. (2) The LD 50 for the matured plants was to ranged from 1.0 at 9.0 Gy. and immature 1.0 at 8.0 Gy. (3) The better doses was at 7.5 Gy. (4) The meristem gamma irradiation at 7.5 Gy. showed in the first culture: the adventitious bud induced and the multi meristem formation. (5) In the second cultured the results reveals the 'variegadas' plants formations and the new purples flowers. (Author).

2175 (INIS-mf–13731, pp. 47) **Track uranium estimation in beverage using SSNTD.** Zheng Liping (Academia Sinica, Shanghai, SH (China). Shanghai Inst. of Nuclear Research); Lin Junying; Cheng Yulin; Hao Xiuhong. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEVERAGES/dielectric track detectors; URANIUM; BEVERAGES; FISSION TRACKS; RADIATION HAZARDS; TRACE AMOUNTS; URANIUM

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

2176 (LA-UR–93-2986) **Interpretation of the MEG-MUSIC scan in biomagnetic source localization.** Mosher, J.C. (Los Alamos National Lab., NM (United States)); Lewis, P.S.; Leahy, R.M. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308165–1: BIOMAG 93: international conference on biomagnetism, Vienna (Austria), 16-20 Aug 1993). Order Number DE93040125. Source: OSTI; NTIS; GPO Dep.

MEG-Music is a new approach to MEG source localization. MEG-Music is based on a spatio-temporal source model in which the observed biomagnetic fields are generated by a small number of current dipole sources with fixed positions/orientations and varying strengths. From the spatial covariance matrix of the observed fields, a signal subspace can be identified. The rank of this subspace is equal to the number of elemental sources present. This signal sub-space is used in a projection metric that scans the three dimensional head volume. Given a perfect signal subspace estimate and a perfect forward model, the metric will peak at unity at each dipole location. In practice, the signal subspace estimate is contaminated by noise, which in turn yields MUSIC peaks which are less than unity. Previously we examined the lower bounds on localization error, independent of the choice of localization procedure. In this paper, we analyzed the effects of noise and temporal coherence on the signal subspace estimate and the resulting effects on the MEG-MUSIC peaks.

5601 Radiation Effects

Refer also to citation(s) 386, 387, 391, 417, 421, 450, 467, 492, 764, 792, 1165, 1292, 1293, 1294, 1295, 1616, 1622, 1633, 1665, 1798, 1907, 1967, 2048, 2112, 2128, 2135, 2139, 2142, 2169

2177 (ANL/BIM/PP–77489) **Expression of cytoskeletal and matrix genes following exposure to ionizing radiation: Dose-rate effects and protein synthesis requirements.** Woloschak, G.E. (Argonne National Lab., IL (United States)); Felcher, P.; Chang-Liu, Chin-Mei. Argonne National Lab., IL (United States). [1992]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040893. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments were designed to examine the effects of radiation dose-rate and of the protein synthesis inhibitor cycloheximide on expression of cytoskeletal elements (γ- and β-actin and α-tubulin) and matrix elements (fibronectin) in Syrian hamster embryo cells. Past work from our laboratory had already demonstrated optimum time points and doses for examination of radiation effects on accumulation of specific transcripts. Our results here demonstrated little effect of dose-rate for JANUS fission spectrum neutrons when comparing expression of either α-tubulin or fibronectin genes. Past

work had already documented similar results for expression of actin transcripts. Effects of cycloheximide, however, revealed several interesting and novel findings: (1) Cycloheximide repressed accumulation of α-tubulin following exposure to high dose-rate neutrons or γ rays; this did not occur following similar low dose-rate exposure (2) Cycloheximide did not affect accumulation of mRNA for actin genes. Cycloheximide abrogated the moderate induction of fibronectin-mRNA which occurred following exposure to γ rays and high dose-rate neutrons. These results suggest a role for labile proteins in the maintenance of α-tubulin and fibronectin mRNA accumulation following exposure to ionizing radiation. In addition, they suggest that the cellular/molecular response to low dose-rate neutrons may be different from the response to high dose-rate neutrons.

2178 (ANL/BIM/PP–78894) **Lymphocytes from wasted mice express enhanced spontaneous and γ-ray-induced apoptosis.** Woloschak, G.E. (Argonne National Lab., IL (United States)); Chang-Liu, Chin-Mei; Chung, Jen; Libertin, C.R. Argonne National Lab., IL (United States). [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040889. Source: OSTI; NTIS; GPO Dep.

Mice bearing the autosomal recessive mutation wasted (wst/wst) display a disease pattern including faulty repair of DNA damage in lymphocytes after radiation exposure, neurologic abnormalities, and immunodeficiency. Many of the features of this mouse model have suggested a premature or increased spontaneous frequency of apoptosis in thymocytes; past work has shown an inability to establish cultured T cell lines, an abnormally high death rate of stimulated T cells in culture, and an increased sensitivity of T cells to the killing effects of ionizing radiations in wst/wst mice relative to controls. The experiments reported here were designed to examine splenic and thymic lymphocytes from wasted and control mice for signs of early apoptosis. Our results revealed enhanced expression of Rp-8 mRNA (associated with apoptosis) in thymic lymphocytes and reduced expression in splenic lymphocytes of wst/wst mice relative to controls; expression of Rp-2 and Td-30 mRNA (induced during apoptosis) were not detectable in spleen or thymus. Higher spontaneous DNA fragmentation was observed in wasted mice than in controls; however, γ-ray-induced DNA fragmentation peaked at a lower dose and occurred to a greater extent in wasted mice relative to controls. These results provide evidence for high spontaneous and γ-ray-induced apoptosis in T cells of wasted mice as a mechanism underlying the observed lymphocyte and DNA repair abnormalities.

2179 (ANL/CMB/PP–80219) **Inhibition of topoisomerase IIα activity in CHO K1 cells by 2-[(aminopropyl)amino]ethanethiol (WR-1065).** Grdina, D.J. (Argonne National Lab., IL (United States)); Constantinou, A.; Shigematsu, N.; Murley, J.S. Argonne National Lab., IL (United States). Jun 1993. 32p. Sponsored by USDOE, Washington, DC (United States); National Cancer Inst., Bethesda, MD (United States). DOE Contract W-31109-ENG-38. Grant CA 37435. Order Number DE93040882. Source: OSTI; NTIS; INIS; GPO Dep.

The aminothiol 2-[(aminopropyl)amino]ethanethiol (WR-1065) is the active thiol of the clinically studied radioprotective agent S-2-(3-aminopropylamino)ethylphosphorothioic acid (WR-2721). WR-1065 is an effective radiation protector and antimutagenic agent when it is administered 30 min prior to radiation exposure to Chinese hamster ovary KI cells at a concentration of 4 mM. Under these exposure conditions, topoisomerase (topo) I and II activities and associated protein contents were measured in the K1 cell line using the DNA relaxation assay, the P4 unknotting assay, and immunoblotting, respectively. WR-1065 was ineffective in modifying topo I activity, but it did reduce topo IIa activity by an average of 50 percent. The magnitude of topo IIa protein content, however, was not affected by these exposure conditions. Cell cycle effects were monitored by the method of flow cytometry. Exposure of cells to 4 mM WR-1065 for a period of up to 6 h resulted in a buildup of cells in the G2 compartment. However, in contrast to topo II inhibitors used in chemotherapy, WR-1065 is an effective radioprotector agent capable of protecting against both radiation-induced cell lethality and mutagenesis. One of several mechanisms of radiation protection attributed to aminothiol compounds such as WR-1065 has been their ability to affect endogenous enzymatic reactions involved in DNA synthesis, repair, and cell cycle progression. These results are consistent with such a proposed mechanism and demonstrate in particular a modifying effect by 2-[(aminopropyl)amino]ethanethiol on type II topoisomerase, which is involved in DNA synthesis.

2180 (ANL/CMB/PP–80243) **Protection against radiation-induced mutations at the hprt locus by spermine and N,N''-(dithiodi-2,1-ethanediyl)bis-1,3-propanediamine (WR-33278).** Grdina, D.J. (Chicago Univ., IL (United States). Dept. of Radiation and Cellular Oncology); Schwartz, J.L.; Shigematsu, N. Argonne National Lab., IL (United States). Jun 1993. 23p. Sponsored by USDOE, Washington, DC (United States); National Cancer Inst., Bethesda, MD (United States). DOE Contract W-31109-ENG-38. Grant CA 37435. Order Number DE93040881. Source: OSTI; NTIS; INIS; GPO Dep.

The polyamine spermine and the disulfide NN''-(dithiodi-2,1-ethanediyl)bis-1,3-propanediamine (WR-33278) are structurally similar agents capable of binding to DNA. WR-33278 is the disulfide moiety of the clinically studied radioprotective agent (WR-2721). Because of their structural similarities, it was of interest to characterize and compare their radioprotective properties using the endpoints of cell survival and mutation induction at the hypoxanthine-guanine phosphoribosyl transferase (hprt) locus in Chinese hamster AA8 cells. In order to facilitate both the uptake of VM-33278 into cells and the direct comparison between the protective properties of WR-33278 and spermine, these agents were electroporated into cells. Electroporation alone reduced cell survival to 75% but had no effect on hprt mutation frequency. The electroporation of either spermine or WR-33278 at concentrations greater than 0.01 mM was extremely toxic. The exposure of cells to both electroporation and irradiation gave rise to enhanced cell killing and mutation induction. Cell survival values at a radiation dose of 750 cGy were enhanced by factors of 1.3 and 1.8 following electroporation of 0.01 mM of spermine and WR-33278, respectively, 30 min prior to irradiation. Neither agent was protective at a concentration of 0.001 mM. Protection against radiation-induced hprt mutations was observed for both spermine and WR-33278 under all experimental conditions tested.

2181 (ANL/CMB/PP–80927) **Identification of a polymorphic site as a mutational site in exon VI of the mouse p53 gene.** Paunesku, T.; Gemmell, M.A.; Crkvenjakov, R.; Woloschak, G.E. Argonne National Lab., IL (United States). Jul 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001298. Source: OSTI; NTIS; INIS; GPO Dep.

Sequencing by hybridization techniques are being used to analyze the incidence of specific p53 mutations associated with radiation-induced and spontaneous lymphosarcomas in mice. One sequence difference noted as being a mouse strain-specific polymorphism has been identified through these experiments as being a mutational, rather than a polymorphic, site.

2182 (ANL/CMT/CP–80616) **Review of ICRP-60: Implications for radioactive waste management.** Devgun, J.S. Argonne National Lab., IL (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308152–2: ICRP-60: International Atomic Energy Agency interregional training course on management of radioactive waste from nuclear power plants, Argonne, IL (United States), 23 Aug - 17 sep 1993). Order Number DE93040235. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation exposure has generally been managed based on exposure or dose limits. These limits have undergone revisions every decade or so as further information on the biological effects of various types of radiation become available. For example, in the early 1950's for workers, a whole body dose limit of 3 mSv (0.3 rem) per week was being used in the United States until 1957 when the National council on Radiation Protection and Measurements, (NCRP) recommended a limit of 50 mSv (5 rem) per year. Currently, the US Nuclear Regulatory Commission (NRC) specifies a whole body limit of 1.25 rem per calendar quarter (5 rem/y)(10CFR 20).

2183 (ANL/CMT/CP–80617) **Main principles of radiation protection and their applications in waste management.** Devgun, J.S. Argonne National Lab., IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308152–1: ICRP-60: International Atomic Energy Agency interregional training course on management of radioactive waste from nuclear power plants, Argonne, IL (United States), 23 Aug - 17 sep 1993). Order Number DE93040232. Source: OSTI; NTIS; INIS; GPO Dep.

The average exposure for an individual from such background in the United States is about 300 mrem per year with approximately 200 mrem of this coming from radon exposure alone. In addition to the natural sources of background radiation, a very small amount of the background radiation occurs due to the nuclear weapons test fallout. Manmade sources of radiation also include certain consumer products, industrial and research use of radioisotopes, medical X-rays, and radiopharmaceuticals. When all sources, natural and man-made, are taken into account, the National Council on Radiation Protection and Measurements (NCRP) has estimated that the average annual dose to individuals in the US population is 360 mrem (NCRP Report No. 93). In this report the fundamental principles of radiation protection are reviewed, as well as the relevant laws and regulations in the United States and discuss application of radiation protection in radioactive waste management.

2184 (ANL/EA/CP–79756) **Use of the exposure unit concept in risk assessments: A case study for Los Alamos National Laboratory.** Hartmann, H.M. (Argonne National Lab., IL (United States)); Butler, J.P.; Dorries, A.M.; Beck, J.R. Argonne National Lab., IL (United States). Oct 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931095–21: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94001438. Source: OSTI; NTIS; INIS; GPO Dep.

The use of the exposure unit concept to refine intake estimates in quantitative risk assessments is explained. The selection of appropriate exposure unit areas for varying receptors and the application of the concept to large sites and to relatively small solid waste management units (SWMUs) are discussed. Examples are presented.

2185 (ANL/EAIS/RP–75543) **Derivation of cesium-137 residual radioactive material guidelines for the Peek Street site, Schenectady, New York.** Jones, L.; Nimmagadda, M.; Yu, C. Argonne National Lab., IL (United States). Environmental Assessment and Information Sciences Div. Jan 1992. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93019561. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for cesium-137 were derived for the Peek rk. The derivation was based on the requirement that the Street site in Schenectady, New York. The derivation was based on the requirement that the 50-year committed effective dose equivalent to a hypothetical individual who lives or works in the immediate vicinity of the Peek Street site should not exceed a dose of 100 mrem/yr following remedial action. The US Department of Energy (DOE) residual radioactive material guideline computer code, RESRAD was used in this evaluation. Three potential scenarios were considered for the site on the assumption that for a period of 1,000 years following remedial action, the site wig be utilized without radiological restrictions. The scenarios vary with regard to use of the site, time spent at the site, and sources of food consumed. Results indicate that the basic dose limit of 100 mrem/yr will not be exceeded for cesium-137 within 1,000 years, provided that the soil concentration of cesium-137 at the Peek Street site does not exceed the following levels: 98 pCi/g for Scenario A (industrial worker: the expected scenario), 240 pCi/g for Scenario B (recreationist: a plausible scenario), and 34 pCi/g for Scenario C (resident farmer ingesting food produced in the decontaminated area: a plausible scenario).

2186 (ANL/EAIS/TM–103) **A compilation of radionuclide transfer factors for the plant, meat, milk, and aquatic food pathways and the suggested default values for the RESRAD code.** Wang, Y.Y.; Biwer, B.M.; Yu, C. Argonne National Lab., IL (United States). Aug 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000632. Source: OSTI; NTIS; GPO Dep.

The ongoing development and revision of the RESRAD computer code at Argonne National Laboratory requires update of radionuclide transfer factors for the plant, meat, milk, and aquatic food pathways. Default values for these transfer factors used in published radiological assessment reports are compiled and compared with values used in RESRAD. The differences among the reported default values used in different radiological assessment codes and reports are also discussed. In data comparisons, values used in more recent reports are given more weight because more recent experimental work tends to be conducted under better-defined laboratory or field conditions. A new default value is suggested for RESRAD if one of the following conditions is met: (1) values used in recent reports are an order of magnitude higher or lower than the default value currently used in RESRAD, or (2) the same default value is used in several recent radiological assessment reports.

2187 (BN-SA–3799-HEDR) **Software requirements specifications.** Farris, W.T. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9307132–1: Technical steering panel meeting, Post Falls, ID (United States), 15-17 Jul 1993). Order Number DE93018449. Source: OSTI; NTIS; GPO Dep.

This report discusses requirement for radiation dose software at Hanford.

2188 (CEA-CONF–11502) **Measurement of new operational quantities with radiation protection instruments designed for working area monitoring and for individual monitoring.** Prigent, R. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations); Chary, J.; Chemtob, M.; Lebouleux, P.; Herbaut, Y. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Protection de l'Environnement et des Installations. 1992. 4p. (In French). (CONF-9205305–: Worldwide achievement in public and occupational health protection against radiation (IRPA 8), Montreal (Canada), 17-23 May 1992). Order Number DE94604439. Source: OSTI; NTIS (US Sales Only); INIS.

The ICRP recommended a dose limitation system based on numerical evaluation of the dose equivalent to organs or tissues, H_T, which are used to calculate the effective dose, H_E, by weighting. The ICRU proposed new operational quantities accessible to measurement which are conservative with respect to these recommendations. The objective of this paper is to recall briefly the basic recommendations and to find out if radiation protection instruments presently used calibrated in terms of the previous quantities are capable to measure these new quantities. A dozen of practical cases are presented.

2189 (CNIC–00610) **Research on some boron-bearing fabric and transparent resin materials shielding neutron efficiency.** Chen Changmao (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Su Jingling; Wang Zheng; Liu Jinhua. China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 10p. (In Chinese). (IAE–0103.). Order Number DE94604438. Source: OSTI; NTIS (US Sales Only); INIS.

The shielding neutron efficiency of boron-bearing materials developed recently is introduced. The thermal neutron shield ratio for two kinds of non-waving cloth with thickness of 58 mg/cm^2 and 153 mg/cm^2 is 51% and 79%. Their mass attenuation coefficient for 0.186, 24.4 and 144 keV neutron is 1.56, 1.29 and 0.9 cm^2/g separately. For the neutral boron-bearing transparent resin plate with the thickness of 0.59 g/cm^2, the thermal neutron shield ratio is 85% and for enriched boron or gadolinium-bearing resin plate is 97%. The shield ratios of all three materials for 24.4 keV neutrons are 38%. The transparence of natural light for enriched boron-bearing resin plates is no considerable change after they were exposed to thermal neutrons up to 6 Sv. After they were exposed up to 20 Sv, the transparence reduces to 50% but the thermal neutron shield ratio does not change. The gadolinium-bearing plate has a very strong thermal neutron-capture gamma radiation and its dose-equivalent is greater than the dose-equivalent of incident thermal neutrons.

2190 (CNIC–00662) **Radioprotective effect of edible herbs.** Jiang Ying (Suzhou Medical Coll., JS (China)); Huang Meiying; Zhu Genbo; Fang Jixi; Fan Xiudi. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 9p. (In Chinese). (SMC–0084.). Order Number DE94604365. Source: OSTI; NTIS (US Sales Only); INIS.

The radioprotective effect of the edible herbs was studied in animals. The results showed: (1) The acute death rate of animals was decreased. (2) The peripheral leukocytes were increased. (3) The valine, hydroxyproline, glycine, aspartic acid and glutamic acid in the plasma also were increased. (4) The activity of SOD (superoxide dimutase) was risen. (5) the edible herbs have the function to protect the structure of organs of thymus and testes.

2191 (CNIC–00666) **Radiosensitivity of higher plants.** Feng Zhijie (Inst. for Appliction of Atomic Energy, CAAS, Beijing (China)). China Nuclear Information Centre, Beijing, BJ (China). Nov 1992. 10p. (In Chinese). (CSNAS–0063.). Order Number DE94604362. Source: OSTI; NTIS (US Sales Only); INIS.

The general views on radiosensitivity of higher plants have been introduced from published references. The radiosensitivity varies with species, varieties and organs or tissues. The main factors of determining the radiosensitivity in different species are nucleus volume, chromosome volume, DNA content and endogenous compounds. The self-repair ability of DNA damage and chemical group of biological molecules, such as -SH thiohydroxy of proteins, are main factors to determine the radiosensitivity in different varieties. The moisture, oxygen, temperature radiosensitizer and protector are important external factors for radiosensitivity. Both the multiple target model and Chadwick-Leenhouts model are ideal mathematical models for describing the radiosensitivity of higher plants and the latter has more clear significance in biology.

2192 (CNIC–00669) **The toxicological study of plutonium: tumor-inducing effect of plutonium in rats.** Chen Rusong (China Inst. for Radiation Protection, Taiyuan (China)); Zhao Yongchan; Wang Shoufang; Li Maohe. China Nuclear Information Centre, Beijing, BJ (China). Sep 1992. 10p. (In Chinese). (CIRP–0003.). Order Number DE94604384. Source: OSTI; NTIS (US Sales Only); INIS.

The carcinogenic effects of Pu compounds through different routs of administration are introduced. The following results have been obtained: (1) Pu is really a powerful carcinogenic radionuclide. (2) Osteosarcoma can be induced in rats by plutonium nitrate at low level radiation. The incidence is from 38.9% to 42.9% in the 185 kBq/kg group. (3) Lung cancer can be induced by plutonium dioxide and the biological effect of TLN (thoracic lymph node) is significant. (4) Under the combined treatment of ^{239}Pu, ^{90}Sr and ^{144}Ce, the carcinogenic effects is much greater than their separative effect on rats. (5) By using the method of comparative toxicology, the risk of osteosarcoma induced by Pu in human is about 600/(10^6 man·cGy) which is extrapolated from animal to human. The above conclusions are important for evaluating the potential hazard of Pu to human beings.

2193 (CONF-9106235–7) **The Martin Marietta Energy Systems personnel neutron dosimetry program.** McMahan, K.L. Oak Ridge National Lab., TN (United States). [1991]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 11. Department of Energy workshop on personnel neutron dosimetry; Las Vegas, NV (United States); 4-7 Jun 1991. Order Number DE94002197. Source: OSTI; NTIS; GPO Dep.

Martin Marietta Energy Systems, Inc. (Energy Systems), manages five sites for the US Department of Energy. Personnel dosimetry for four of the five sites is coordinated through a Centralized External Dosimetry System (CEDS). These four sites are the Oak Ridge National Laboratory (ORNL), the Oak Ridge Y-12 Plant (Y-12), the Oak Ridge K-25 Site (K-25), and the Paducah Gaseous Diffusion Plant (PGDP). The fifth Energy Systems site, Portsmouth Gaseous Diffusion Plant, has an independent personnel dosimetry program. The current CEDS personnel neutron dosimeter was first issued in January 1989, after an evaluation and characterization of the dosimeters' response in the workplaces was performed. For the workplace characterization, Energy Systems contracted with Battelle Pacific Northwest Laboratory (PNL) to perform neutron measurements at selected locations at ORNL and Y-12. K-25 and PGDP were not included because their neutron radiation fields were similar to others already planned for characterization at ORNL and Y-12. Since the initial characterization, PNL has returned to Oak Ridge twice to perform follow up measurements, and another visit is planned in the near future.

2194 (DOE/METC/C–93/7098) **Innovative technologies for recycling contaminated concrete and scrap metal.** Bossart, S.J. (USDOE Morgantown Energy Technology Center, WV (United States)); Moore, J. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). (CONF-931095–4: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE93041131. Source: OSTI; NTIS; INIS; GPO Dep.

Decontamination and decommissioning of US DOE's surplus facilities will generate enormous quantities of concrete and scrap metal. A solicitation was issued, seeking innovative technologies for recycling and reusing these materials. Eight proposals were selected for award. If successfully developed, these technologies will enable DOE to clean its facilities by 2019.

2195 (DOE/OR/00033–T540) **Application of a canine ^{238}Pu dosimetry model to human bioassay data.** Hickman, A.W. Jr. (Florida Univ., Gainesville, FL (United States)). Oak Ridge Associated Universities, Inc., TN (United States); Florida Univ., Gainesville, FL (United States). Aug 1991. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000834. Source: OSTI; NTIS; GPO Dep.

Associated with the use of $2^{238}Pu$ in thermoelectric power sources for space probes and power supplies for cardiac devices is the potential for human exposure to ^{238}Pu, primarily by inhalation. In the event of human internal exposure, a means is needed for assessing the level of intake and calculating radiation doses. Several bioassay/dosimetry models have been developed for ^{239}Pu. However, results from studies with laboratory animals have indicated that the biokinetics, and therefore the descriptive models, of ^{238}Pu are significantly different from those for ^{239}Pu. A canine model accounting for these differences has been applied in this work to urinary excretion data from seven humans occupationally exposed to low levels of an insoluble ^{238}Pu compound. The modified model provides a good description of the urinary excretion kinetics observed in the exposed humans. The modified model was also used to provide estimates of the initial intakes of ^{238}Pu for the seven individuals; these estimates ranged from 4.5 nCi (170 Bq) to 87 nCi (3200 Bq). Autopsy data on the amount and distribution of ^{238}Pu retained in the organs may be used in the future to validate or refute both these estimates and the assumptions used to formulate the human model. Modification of the human model to simulate an injection exposure to ^{239}Pu gave patterns of retention in the organs and urinary excretion comparable to those seen previously in humans; further modification of the model using fecal data (unavailable for the subjects of this study) is indicated.

2196 (DOE/OR/00033–T556) **An analytical method for estimating the ^{14}N nuclear quadrupole resonance parameters of organic compounds with complex free induction decays for radiation effects studies.** Iselin, L.H. Oak Ridge Inst. for Science and Education, TN (United States); Florida State Univ., Tallahassee, FL (United States). 1992. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000850. Source: OSTI; NTIS; INIS; GPO Dep.

The use of ^{14}N nuclear quadrupole resonance (NQR) as a radiation dosimetry tool has only recently been explored. An analytical method for analyzing ^{14}N NQR complex free induction decays is presented with the background necessary to conduct pulsed NQR experiments. The ^{14}N NQR energy levels and possible transitions are derived in step-by-step detail. The components of a pulsed NQR spectrometer are discussed along with the experimental techniques for conducting radiation effects experiments using the spectrometer. Three data analysis techniques – the power spectral density Fourier transform, state space singular value decomposition (HSVD), and nonlinear curve fitting (using the downhill simplex method of global optimization and the Levenberg-Marquart method)

– are explained. These three techniques are integrated into an analytical method which uses these numerical techniques in this order to determine the physical NQR parameters. Sample data sets of urea and guanidine sulfate data are used to demonstrate how these methods can be employed to analyze both simple and complex free induction decays. By determining baseline values for biologically significant organics, radiation effects on the NQR parameters can be studied to provide a link between current radiation dosimetry techniques and the biological effects of radiation.

2197 (DOE/OR/21607–2) **[Technical support in the testing of microoganisms for their ability to accumulate strontium and cesium from aqueous solutions]: Final reports, Task order No. 2.** Oak Ridge Research Inst., TN (United States). 15 Jun 1987. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21607. Order Number DE94000854. Source: OSTI; NTIS; GPO Dep.

This report describes the binding of cesium and strontium ions from aqueous solution in a variety of microorganisms. Data is provided on the absorption by Ashbya gossyppi, Chlorella pyrenoidosa, Candida sp. MI13, Saccharomyces cerevisiae, Scenedesmus obliqus, Streptococcus mutans, Anabaena flosaquae, Escherichia coli, Streptomyces viridochromogenes, Chlamydomonas reinhardtii, Rhizopus oryzae, Bacillus megaterium, Micrococcus luteus, Zoogloea ramigera, Coelastrum proboscideum, Pseudomonas aeruginosa, Citrobacter freundii, Paecilomyces marquandi, and Caulobacter fusiformis.

2198 (ETDE-IT–93-243) **Dose eqivalents per unit fluence for tissue equivalent slab phantoms for electrons from 50 keV to 10 MeV.** Gualdrini, G.F. (ENEA, Bologna (Italy)); Padoani, F. 1993. 8p. (CONF-9305175–3: Individual monitoring of ionizing radiation: the impact of recent ICRP and ICRU publications, Villigen (Germany), 5-7 May 1993). Order Number DE94716595. Source: OSTI; NTIS (US Sales Only).

The MCNPE-BO and MCNP4 Monte Carlo electron-photon codes were used to calculate the dose equivalent per unit fluence at various depths in tissue equivalent slab phantoms for broad parallel beams of mono-energetic electrons with energies from 50 keV to 10 MeV. The study was carried out in the framework of the activities of an ICRP (International Commission on Radiation Protection)/ICRU Joint Task Group with the support of EURADOS WG4 (Computational Dosimetry). Some preliminary results and comparisons, as well as, a general discussion on the performances of the codes are presented, which demonstrate a satisfactory agreement among the results obtained using the two codes and those of other authors.

2199 (HW–30306) **Radiological Sciences Department: Research and development: Annual report, Fiscal Year 1953.** Kornberg, H.A.; Pearce, D.W. (comps.); Mickelson, M.L. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Dec 1953. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001620. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report details activities of the Radiological Sciences Department during the 1953 Fiscal Year.

2200 (INIS-BR–3148, pp. 444-447) **Obtention of scintillography images by low density lipoproteins labelled with technetium 99.** Silva, S. (Sao Paulo Univ., SP (Brazil). Faculdade de Medicina); Coelho, I.; Zanardo, E.; Pileggi, F.; Meneguethi, C.; Maranhao, R.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The low density lipoproteins carry the most part of the cholesterol in the blood plasma. These lipoproteins are labelled with technetium-99-m and have been used for obtaining images in nuclear medicine. The introduction of this technique is presented, aiming futures clinical uses. Scintillographic images are obtained 25 minutes and 24 hours after the injection of 3 m Ci of low density lipoproteins - technetium-99 m in rabbits. (C.G.C.).

2201 (INIS-BR–3148, pp. 448-451) **Contribution for labelling study of blood elements with technetium-99 m.** Gutfilen, B. (Universidade do Estado, Rio de Janeiro, RJ (Brazil). Centro Biomedico); Boasquevisque, E.M.; Bernardo-Filho, M. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The contribution for labelling study of blood elements (erythrocytes, leukocytes and plasma proteins) with technetium 99 m, from results obtained in the Biomedical Center of Rio de Janeiro University and in the Research Center of National Institute of Cancer is shown. (C.G.C.).

2202 (INIS-BR–3148, pp. 452-455) **Contribution for labelling study of cellular and molecular structures of biomedical interest with technetium 99.** Rebello, L.H. (Universidade do Estado, Rio de Janeiro, RJ (Brazil). Centro Biomedico); Piotkwosky, M.C.; Pereira, J.A.A.; Boasquevisque, E.M.; Silva, J.R.M.; Reis, R.J.N.; Pires, E.T.; Bernardo-Filho, M. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The methodologies for labelling bacteria, planaria and cercaria from schistosomiasis evolution cycle and in oxamniquine with technetium 99 m, developed in the Biomedical Center of Rio de Janeiro University and in the Research Center of National Institute of Cancer are shown. (C.G.C.).

2203 (INIS-BR–3148, pp. 456-459) **Evaluation of leucocytes labelling technique with ^{99m}Tc - HMPAO.** Moraes, D.W. (Sao Paulo Univ., SP (Brazil). Centro de Medicina Nuclear); Marinho, N.S.; Rezende, M.E.X.; Buchpiguel, C.A.; Rockmann, T.M.B. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

An evaluation of the leukocytes labelling technique with HMPAO-^{99m}Tc, using low volume of blood and keeping the labelling efficiency and cellular viability in compatible levels with those preconized by the literature is presented. (C.G.C.).

2204 (INIS-BR–3148, pp. 513-516) **Implementation of metrology in diagnostic radiology at National Laboratory of Ionization Radiation Metrology.** Peixoto, J.G.P. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia); Freitas, L.C. de. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

Studies aiming the calibration implementation of measuring instruments used in radiodiagnosis are presented. Considerations about x-ray beam qualities, dosimetric standards and the results from energy dependence of some ionization chambers for x-ray beams of 40 to 150 kV are also shown. (C.G.C.).

2205 (INIS-BR–3148, pp. 547-549) **Medical and radioprotection procedures for ionizing radiations.** Santos, C.A.R. dos (Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil)). Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The medical procedures and the radiation protection of ionizing radiation are presented, including the general instruction, the biological investigation, the radioactive contamination, the biological factors, the treatment principles, the organization and the planning. (C.G.C.).

2206 (INIS-BR–3148, pp. 558-561) **Occupational radioprotection program at Nuclear Engineering Institute -IEN: results obtained in 1991.** Fajardo, P.W. (Instituto de Engenharia Nuclear (IEN), Rio de Janeiro, RJ (Brazil)); Pastura, V.F.S.; Soares, M.L.; LeRoy, C.L.; Teixeira, M.V.; Santos, I.H.T.; Pujol Filho, S.V. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The results of occupational radioprotection program at Nuclear Engineering Institute-IEN- in 1991 are presented. The personnel monitoring, the routine monitoring of limited areas, the operational monitoring during the operation and the cyclotron CV-28 maintenance, the radioisotope processing and Argonauta Reactor operation, the control of radioprotection equipment and the control of radiation sources are included. (C.G.C.).

2207 (INIS-BR–3148, pp. 562-563) **Radioprotection in Brazilian universities.** Caballero, K.C. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Escola de Engenharia); Borges, J.C. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this work was to obtain a broad knowledge of the circumstances under which activities involving ionizing radiations are held at brazilian academic institutions. Around 90 institutions (universities and isolated schools of both public and private sectors) were invited, by mail, to answer an inquiry with questions from technical to legal aspects of their activities with radiations. Information received from 2/3 of institutions contacted, permitted conclusions as: there is a wide ignorance about radioprotection procedures and legislation, although few universities maintain some efficient radioprotection staff; there is a need for the establishment of a standard radioprotection text dedicated to those specific activities of the sector. (author).

2208 (INIS-BR–3148, pp. 564-566) **Personnel monitoring in workers from North and Northeast of Brazil, occupationally exposed to ionizing radiations.** Antonio Filho, J. (Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear); Jesus Lopes Filho, F. de; Colaco, W.; Silveira, S.V. da. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The personnel monitoring of workers from North and Northeast of Brazil, occupationally exposure to ionizing radiations was evaluated, from the registers of existence doses in the archives et Personnel Monitoring Laboratory of Nuclear Energy Department from Pernambuco Federal University. The data were selected, considering six areas: radiotherapy, nuclear medicine, radiodiagnosis, research, industry and cineangiocoronaryography. (C.G.C.).

2209 (INIS-BR–3148, pp. 567-569) **Annual average equivalent dose of workers form health area.** Daltro, T.F.L. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Campos, L.L. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The data of personnel monitoring during 1985 and 1991 of personnel that work in health area were studied, obtaining a general overview of the value change of annual average equivalent dose. Two different aspects were presented: the analysis of annual average equivalent dose in the different sectors of a hospital and the comparison of these doses in the same sectors in different hospitals. (C.G.C.).

2210 (INIS-BR–3148, pp. 570-572) **Absorbed doses by a technician, with and without (simulating) use of protection devices, in bone scintigraphy examination.** Jesus Lopes Filho, F. de (Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear); Antonio Filho, J.; Colaco, W.; Silveira, S.V. da; Santos Rodrigues, D. dos. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The relation between the whole-body dose and the dose localized in body pants of a technician work in nuclear medicine was investigated by dosimetric films and thermoluminescent dosemeters. The investigation was made with and without a suitable protection devices. The results were discussed by a radiological protection view. (C.G.C.).

2211 (INIS-BR–3148, pp. 585-587) **Field dosimetry on sterilization area of medical-hospitable materials.** Mariano, C.S.T.P. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Campos, L.L. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The calcium sulfate doped with dysprosium, used in high dose dosimetry by electron paramagnetic resonance (EPR), is studied on field dosimetry for medical-hospitable materials sterilization. The calibration curves of EPR signal in function of absorbed dose in air and the thermal decay of EPR signal at room temperature are also presented. (C.G.C).

2212 (INIS-BR–3148, pp. 588-590) **Evaluation of BPW-34 photodiode answer for 10 MeV electron dosimetry.** Khoury, H.J. (Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear); Melo, F.A.; Hazin, C.A.; Mascarenhas, A.P. Sociedade Brasileira de Engenharia Biomedica, Sao Paulo, SP (Brazil); Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Biologia e Medicina Nuclear, Rio de Janeiro, RJ (Brazil); Sociedade Brasileira de Protecao Radiologica, Sao Paulo, SP (Brazil). 1992. 694p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). In *Proceedings of the 1. National Forum of Science and Technology on Health; 13. Brazilian Congress on Biomedical Engineering; 4. Brazilian Congress of Physicists on Medicine; Brazilian Meeting on Biology and Nuclear Medicine; Brazilian Meeting on Radiological Protection.* Order Number DE94604139. Source: OSTI; NTIS (US Sales Only); INIS.

The viability of commercial photodiodes used for dosimetry of high energy electron beams was studied. The measures were made in a linear accelerators of 10 MeV, using the BPW-34 photodiode. The average energy of electrons on phantom surface and their average range were determined with the photodiode, and the results were compared with the obtained with a ionization chamber of parallel plate. (C.G.C.).

2213 (INIS-mf–13720) **Effect of the mutation of recB21 of Escherichia coli on indirect recombinogenesis of bacteriophage lambda.** Castillo-Villanueva, A. Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Ciencias. 1993. 70p. (In Spanish). Order Number DE94604340. Source: OSTI; NTIS (US Sales Only); INIS.

In this work two undamaged amber lambda mutants were crossed in UV-irradiated Escherichia coli host cells and the total and recombinant λ^+ progenies scored after one lytic cycle. In a wild - type strain, such treatment produces an stimulation of 5-7 times in the production of recombinant λ^+ particles, accompanied by a variable but consistent increase in the total phage pro genie too. The effect has been designed as indirect recombinogenesis of bacteriophage lambda because it is elicited among undamaged λ genomes by the UV irradiation of host cells. Through the use of recB21 mutants we tested the role of the RecBCD enzyme as a whole in the effect just described and observed that in those hosts the effect is absent. The RecBCD enzyme of Escherichia coli has different activities, important for both the genetic recombination and recovery from DNA damage. Among those activities is that of ATP-dependent double-stranded DNA exonuclease, by means of which the enzyme digests the lineal molecules of viral DNA, produced during the late phase of lambda lytic cycle. To face such a destructive activity, λ encodes the Gam protein which inhibits all the activities of RecBCD; so the ability of RecBCD to act in the phage response, may be due either to a residual activity of the enzyme in lambda infected host cells or to an unknown Gam non-inhibited activity of the RecBCD enzyme. because the synthesis of the RecBCD is constitutive, the apparent inducibility of the λ response should be due to another reason such as an increase in the molecular substrates on which the enzyme acts. (Author).

2214 (INIS-mf–13731, pp. 20) **Determination of high LET cosmic particles' trajectories for space radiobiological studies.** Ogura, K. (Nihon Univ., Narashino, Chiba (Japan). Coll. of Industrial Technology); Matusima, M.; Yamada, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COSMIC RADIATION/dielectric track detectors; COSMIC RADIATION/radiobiology; COSMIC RADIATION/trajectories; RADIOBIOLOGY; RADIOBIOLOGY; TRAJECTORIES; LET; SPORES

2215 (INIS-mf–13731, pp. 43) **NRPB PADC neutron personal dosimetry after ICRP 60.** Tanner, R.J. (National Radiological Protection Board, Chilton (United Kingdom)); Bartlett, D.T.; Steel, J.D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PERSONNEL DOSIMETRY/neutron dosimetry; PERSONNEL DOSIMETRY/nrpb; BACKGROUND RADIATION; DIELECTRIC TRACK DETECTORS; DOSE LIMITS; ICRP; NRPB; SENSITIVITY

2216 (INIS-mf–13731, pp. 44) **Implications of new ICRP and ICRU recommendations on the use of S.S.D.T. detectors for neutron dosimetry.** Portal, G. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DOSIMETRY/dielectric track detectors; NEUTRON DOSIMETRY/recommendations; DOSE EQUIVALENTS; DOSE LIMITS; DOSE-RESPONSE RELATIONSHIPS; ICRP; ICRU; RECOMMENDATIONS

2217 (INIS-mf–13731, pp. 46) **Distribution of uranium in mice using the fission track technique.** Lin Junying (Academia Sinica, Shanghai, SH (China). Shanghai Inst. of Nuclear Research); Cheng Yulin; Zhang Jiong. Academia Sinica, Beijing, BJ

(China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM/tissue distribution; DEPOSITION; DIELECTRIC TRACK DETECTORS; FISSION TRACKS; INJECTION; MICE; RADIONUCLIDE KINETICS; URANIUM

2218 (INIS-mf–13731, pp. 187) **Estimation of internal and external dose equivalent rates for the dwellers of Dera Ismail Khan area-Pakistan.** Tufail, M. (Centre for Nuclear Studies, Islamabad (Pakistan)); Matiullah; Ahmad, N.; Khan, E.U. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSE EQUIVALENTS/external irradiation; DOSE EQUIVALENTS/internal irradiation; GAMMA RADIATION; PAKISTAN; PERSONNEL DOSIMETRY; RADON

2219 (INIS-mf–13731, pp. 196) **Uranium estimation in the blood of poikilothermic and homoiothermic animals.** Das, K.C. (Dept. of Zoology, Pandu Coll., Assam (India)); Goswami, T.D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM/tissue distribution; ANIMALS; BLOOD; CONCENTRATION RATIO; DIELECTRIC TRACK DETECTORS; URANIUM; SPECIES DIVERSITY

2220 (INIS-mf–13731, pp. 197) **On the uranium distribution in the internal contamination.** Cucu, M. (Inst. of Phys. and Nuclear Engineering, Bucharest (Romania)); Danis, A.; Ciubotariu, M.; Iancu, B.; Dumitrescu, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM/radionuclide kinetics; URANIUM/tissue distribution; BLOOD; FISSION TRACKS; ORGANS; RATS; URANIUM; INTERNAL IRRADIATION

2221 (INIS-mf–13731, pp. 318) **Study of heavy Ion tracks in certain plants of northern India.** Sharma, M. (D.S. Postgraduate Coll., Agra Univ., (Aligarh)); Maurya, A.N. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLANTS/particle tracks; PLANTS/radiation doses; URANIUM/natural radioactivity; DIELECTRIC TRACK DETECTORS; HEAVY IONS; INDIA; PLANTS; RADIATION DOSE DISTRIBUTIONS; SOILS; URANIUM

2222 (INIS-mf–13731, pp. 319) **Probabilistic statistics models of interaction of Ionizing and neutron radiation with bio-substance.** Rusov, V.D. (Odessa State Univ. (Ukranie)); Zelentsova, T.N.; Babikova, Y.F. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STATISTICAL MODELS/biological radiation effects; ANIMAL CELLS; CHROMOSOMAL ABERRATIONS; IONIZING RADIATIONS; NEUTRONS; PROBABILITY

2223 (INIS-mf–13731, pp. 326) **The track detection use in internal contamination investigations.** Danis, A. (Inst. of Physics and Nuclear Engineering, Bucharest (Romania)); Cucu, M.; Ciubotariu, M. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE TRACKS/radionuclide kinetics; CONTAMINATION; ORGANS; RATS; URANIUM

2224 (JINR-R–16-93-37) **Measurement of the characteristics of JINR neutron reference fields.** Abrosimov, A.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation)); Alekseev, A.G.; Alejnikov, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Dept. of Radiation Safety. 1993. 12p. (In Russian). Order Number DE94605624. Source: OSTI; NTIS (US Sales Only); INIS.

The main characteristics of the JINR neutron reference fields(RF), such as: neutron fluences, spectra, ambient doses equivalent and gamma ray kerma rates have been measured by different methods. The measurements were carried out in the soft RF based on 660 MeV phasotron and two RF based on ^{252}Cf in polyethylene moderators with diameters 12.7 and 29.2 cm. This set of RF is intended for routine neutron dosimeters calibration at conditions that, are similar to working environment. The results of the measurements are presented. The results comparison allows to estimate the systematic errors of the main RF characteristics. 21 refs.; 5 figs.; 3 tabs.

2225 (LA–12662-MS) **Dosimetry at the Los Alamos Critical Experiments Facility: Past, present, and future.** Malenfant, R.E. Los Alamos National Lab., NM (United States). Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001161. Source: OSTI; NTIS; INIS; GPO Dep.

Although the primary reason for the existence of the Los Alamos Critical Experiments Facility is to provide basic data on the physics of systems of fissile material, the physical arrangements and ability to provide sources of radiation have led to applications for all types of radiation dosimetry. In the broad definition of radiation phenomena, the facility has provided sources to evaluate biological effects, radiation shielding and transport, and measurements of basic parameters such as the evaluation of delayed neutron parameters. Within the last 15 years, many of the radiation measurements have been directed to calibration and intercomparison of dosimetry related to nuclear criticality safety. Future plans include (1) the new applications of Godiva IV, a bare-metal pulse assembly, for dosimetry (including an evaluation of neutron and gamma-ray room return); (2) a proposal to relocate the Health Physics Research Reactor from the Oak Ridge National Laboratory to Los Alamos, which will provide the opportunity to continue the application of a primary benchmark source to radiation dosimetry; and (3) a proposal to employ SHEBA, a low-enrichment solution assembly, for accident dosimetry and evaluation.

2226 (LBL–34569) **In vivo chelation of Am(III), Pu(IV), Np(V), and U(VI) in mice by TREN-(Me-3,2-HOPO).** Durbin, P.W.; Kullgren, B.; Xu, J.; Raymond, K.N. Lawrence Berkeley Lab., CA (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States); Department of Health and Human Services, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant ES02698. (CONF-9309138–1: Intakes of radionuclide detection, assessment and limitation of occupational exposure, Bath (United Kingdom), 13-17 Sep 1993). Order Number DE94000569. Source: OSTI; NTIS; GPO Dep.

Octadentate 3,4,3-LI(1,2-HOPO), composed of the acidic hydroxypyridine isomer, 1,2-HOPO, is the most effective ligand yet prepared for in vivo chelation of Pu(IV) and Am(III), but it is difficult to prepare and acutely toxic. Hexadentate TREN-(Me-3,2-HOPO), composed of the less acidic Me-3,2-HOPO isomer, can be produced in relatively large quantities. TREN-(Me-3,2-HOPO) (30 $\mu mol.kg^{-1}$ injected intraperitoneally in mice 3 min to 1 h after intravenous injection of an actinide) removed significant body Pu(IV), Am(III), Np(V), or U(VI) (compared with controls), and those actinide reductions were significantly greater than were obtained with $CaNa_3$-DTPA. TREN-(Me-3,2-HOPO) was almost as effective for

reducing body PU(IV) as 3,4,3-LI(1,2-HOPO). TREN-(Me-3,2-HOPO) is of low acute toxicity in mice and its clinical potential, as a practical compromise between the effectiveness of 3,4,3-LI(1,2-HOPO) and the safety of $CaNa_3$-DTPA, merits further investigation.

2227 (NILU/OR–87/92) **Measurement of radioactivity in Norway: Annual report 1991.** Berg, T.C. Norsk Inst. for Luftforskning, Lillestroem (Norway). Nov 1992. 33p. (In Norwegian). Order Number DE94605625. Source: OSTI; NTIS; INIS.

A nation-wide network of 20 monitoring stations for continuous registration of radioactivity in the air has been established in Norway. Via the telecommunication network collected data are dayly automatically transmitted to the Norwegian Institute for Air Research (NILU). High radiation levels trigger an alarm for immediate transmission. The monitoring system and experiences in connection with its operation are described, and results from measurements in 1991 are presented. No unnormal radioactivity has been recorded in the period. 24 figs.

2228 (NUREG/CR–5631-Rev.1-Add.1) **Contribution of maternal radionuclide burdens to prenatal radiation doses: Relationships between annual limits on intake and prenatal doses: Revision 1, Addendum 1.** Sikov, M.R. (Pacific Northwest Lab., Richland, WA (United States)); Hui, T.E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 110p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–7445-Rev.1-Add.1). Source: OSTI; NTIS; INIS; GPO.

This addendum describes approaches for calculating and expressing radiation doses to the embryo/fetus from maternal intakes of radionuclides at levels corresponding to fractions or multiples of the Annual Limits on Intake (ALI). Information, concerning metabolic or dosimetric characteristics and the placental transfer of selected, occupationally significant radionuclides was presented in NUREG/CR-5631, Revision 1. That information was used to estimate levels of radioactivity in the embryo/fetus as a function of stage of pregnancy and time after entry. Extension of MIRD methodology to accommodate gestational-stage-dependent characteristics allowed dose calculations for the simplified situation based on introduction of 1 μCi into the woman's transfer compartment (blood). The expanded scenarios in this addendum include repeated or chronic ingestion or inhalation intakes by a woman during pregnancy and body burdens at the beginning of pregnancy. Tables present dose equivalent to the embryo/fetus relative to intakes of these radionuclides in various chemical or physical forms and from preexisting maternal burdens corresponding to ALI; complementary intake values (fraction of an ALI and μCi) that yield a dose equivalent of 0.05 rem are included. Similar tables give these measures of dose equivalency to the uterus from intakes of radionuclides for use as surrogates for embryo/fetus dose when biokinetic information is not available.

2229 (ORNL/TM–12433) **Characterization of ventilation ductwork in Building K-29 at the Oak Ridge K-25 Site.** Klasson, K.T.; Corder, S.L. Oak Ridge National Lab., TN (United States). Aug 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93041340. Source: OSTI; NTIS; INIS; GPO Dep.

An extensive sampling and analysis program was initiated in mid-October 1992 to characterize the ductwork of Building K-29 at the Oak Ridge K-25 Site. This building, 4 acres under roof, contains approximately 1500 feet of main exhaust ducts (plenums), not including the side laterals. A large number of hexane-moistened wipe samples were taken from randomly selected locations within the four main plenums and the side lateral ducts. Three wipes were taken from each location and were analyzed for polychlorinated biphenyls (PCBs), uranium, and technetium. These samples were augmented with 12 metal coupon samples (cut from the ducts) that were analyzed for radionuclides and subjected to Toxicity Characteristic Leaching Procedure analyses for toxic metals, base/neutral/acid compounds, and volatile organic compounds. Based on the wipe analyses, with 95% confidence, 95% of the contamination levels in the ductwork are as follows. PCB levels are $< 16{,}200$ and < 2300 $\mu g/100$ cm^2 for the main plenums and side lateral ducts respectively; uranium levels are < 910 and < 6770 $\mu g/100$ cm^2 for the main plenums and side lateral ducts respectively; and technetium levels are $< 16{,}100$ and $< 65{,}000$ pCi/100 cm^2 for the main plenums and side laterals respectively. The levels of radiological contamination found would classify the main and side lateral ducts as contamination areas according to Energy Systems' standards for radiation protection and its interpretation of Attachment 2 of DOE Order 5480.11.

2230 (PNL–8731) **Cancer increase study methodology: A review and discussion of the "Southeastern Massachusetts Health Study 1978–1986".** Sever, L.E.; Baker, D.A.; Gilbert, E.S.; Mahaffey, J.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93041253. Source: OSTI; NTIS; INIS; GPO Dep.

In October 1990 the Massachusetts Department of Public Health released a report of an epidemiologic study of adult leukemia occurring in the vicinity of the Pilgrim 1 Nuclear Power Plant near Plymouth, Massachusetts. The study used a case-control design in which adult leukemia cases occurring between 1978 and 1986 in 22 towns were compared with persons without leukemia (controls) selected from the same study population. Exposure scores, used to estimate potential for exposure to radioactive emissions from Pilgrim, were calculated for all cases and controls. When the exposure scores of cases were compared with those of controls, the analyses showed the scores to be higher for the leukemia cases, suggesting that individuals with the highest potential for exposure to Pilgrim emissions had a significantly increased risk of leukemia. This association was found only for cases diagnosed before 1984; for cases diagnosed during 1984, 1985, or 1986, no association was observed between leukemia case status and potential for exposure to emissions from the plant. Our review of the report and supporting documents shows no major methodologic problems that would account for the finding of an association between leukemia risk and the Pilgrim plant. Examination of the study findings in relation to what is known about leukemia risks associated with radiation exposure, however, indicates that the results of the Southeastern Massachusetts Health Study are inconsistent with a large body of evidence from a number of other studies.

2231 (PNL–8878) **Radiological risk guidelines for nonreactor nuclear facilities at the Pacific Northwest Laboratory.** Lucas, D.E.; Ikenberry, T.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001078. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological risk evaluation guidelines for the public and workers have been developed at the Pacific Northwest Laboratory (PNL) based upon the Nuclear Safety Policy of the US Department of Energy (DOE) established in Secretary of Energy Notice SEN-35-91. The DOE nuclear safety policy states that the general public shall be protected such that no individual bears significant additional risk to health and safety from the operation of a DOE nuclear facility above the risks to which members of the general population are normally exposed. The radiological risk evaluation guidelines developed at PNL are unique in that they are (1) based upon quantitative risk goals and (2) provide a consistent level of risk management. These guidelines are used to evaluate the risk from radiological accidents that may occur during research and development activities at PNL, and are not intended for evaluation of routine exposures. A safety analyst uses the,frequency of the potential accident and the radiological dose to a given receptor to determine if the accident consequences meet the objectives of the Nuclear Safety Policy. The radiological risk evaluation guidelines are an effective tool for assisting in the management of risk at DOE nonreactor nuclear facilities. These guidelines (1) meet the nuclear safety policy of DOE, (2) establish a tool for managing risk at a consistent level within the defined constraints, and (3) set risk at an appropriate level, as compared with other risks encountered by the public and worker. Table S.1 summarizes the guidelines developed in this report.

2232 (PNL–8909) **Summary of recorded external radiation doses for Hanford workers 1944–1989.** Buschbom, R.L.; Gilbert, E.S. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 187p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-76RL01830. Order Number DE94002001. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes recorded external radiation doses for the years 1944 through 1989 received by operations workers who were included in the Hanford Mortality Study. This study population includes all operations workers who were initially employed at the Hanford site from 1944 through 1978. Descriptive summaries are provided for both annual and cumulative whole body penetrating doses. Although the main emphasis of the report is on recorded whole body penetrating dose, summary tables are included for the components of whole body penetrating dose, non-penetrating dose, and extremity dose. Summaries are provided for the entire study population and for subgroups of the population defined by sex, age, number of years since first monitoring, and socioeconomic groups.

2233 (PNL-SA–22100) **Instrument performance evaluation.** Swinth, K.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9303220–1: Workshop on measurement quality assurance for ionizing radiation, Washington, DC (United States), 16-18 Mar 1993). Order Number DE93019615. Source: OSTI; NTIS; INIS; GPO Dep.

Deficiencies exist in both the performance and the quality of health physics instruments. Recognizing the implications of such deficiencies for the protection of workers and the public, in the early 1980s the DOE and the NRC encouraged the development of a performance standard and established a program to test a series of instruments against criteria in the standard. The purpose of the testing was to establish the practicality of the criteria in the standard, to determine the performance of a cross section of available instruments, and to establish a testing capability. Over 100 instruments were tested, resulting in a practical standard and an understanding of the deficiencies in available instruments. In parallel with the instrument testing, a value-impact study clearly established the benefits of implementing a formal testing program. An ad hoc committee also met several times to establish recommendations for the voluntary implementation of a testing program based on the studies and the performance standard. For several reasons, a formal program did not materialize. Ongoing tests and studies have supported the development of specific instruments and have helped specific clients understand the performance of their instruments. The purpose of this presentation is to trace the history of instrument testing to date and suggest the benefits of a centralized formal program.

2234 (PNL-SA–22123) **What can be learned from epidemiologic studies of persons exposed to low doses of radiation?.** Gilbert, E.S. Pacific Northwest Lab., Richland, WA (United States). Apr 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9304204–1: Biological effects of low level exposures to chemicals and radiation, Washington, DC (United States), 26-27 Apr 1993). Order Number DE93018789. Source: OSTI; NTIS; INIS; GPO Dep.

The main objective of radiation risk assessment is to determine the risk of various adverse health effects associated with exposure to low doses and low dose rates. Extrapolation of risks from studies of persons exposed at high doses (generally exceeding 1 Sv) and dose rates has been the primary approach used to achieve this objective. The study of Japanese atomic bomb survivors in Hiroshima and Nagasaki has played an especially important role in risk assessment efforts. A direct assessment of the dose-response function based on studies of persons exposed at low doses and dose rates is obviously desirable. This paper focuses on the potential of both current and future nuclear workers studies for investigating the dose-response functions at low doses, and also discusses analyses making use of the low dose portion of the atomic bomb survivor data. Difficulties in using these data are the statistical imprecision of estimated dose-response parameters, and potential bias resulting from confounding factors and from uncertainties in dose estimates.

2235 (RERF-TR–7-92) **Restricted expression of recombination activating gene (RAG-1) in mouse lymphoid tissues.** Yamamoto, Akihito (Radiation Effects Research Foundation, Nagasaki (Japan). Nagasaki Branch); Fujinaga, Hiroyuki; Hamatani, Kiyohiro; Atsuta, Mitsuru. Radiation Effects Research Foundation, Hiroshima (Japan). Mar 1993. 12p. Order Number DE94718880. Source: OSTI; NTIS; INIS.

In an attempt to determine the distribution of recombinase activity in the mouse thymus, spleen, and lymph nodes, we used the in situ hybridization method to examine the expression of the recombination activating genes RAG-1 and RAG-2. Expression of RAG-1 was found in most cortical thymocytes but not in the majority of medullary thymocytes. Although hybridization signals of RAG-2 were not as intense as those of RAG-1, the localization of RAG-2 transcripts was similar to that of RAG-1. In the spleen, expression of RAG-1 was found only in limited cells near the splenic sinus, and the majority of the cells within the follicle were negative for RAG-1 transcript. In nude mice, RAG-1-expressing cells were detected in the same regions, which suggests that in situ hybridization signals of RAG-1 in the spleen are due to the cells of B-cell origin. In the lymph nodes, expression of RAG-1 was found only in the medullary region. Expression of RAG-2 transcript in the spleen and the lymph nodes, if any, was too faint to allow determination of the specific localization. These results suggest that most of the cortical thymocytes and some cells in the spleen are capable of rearranging T-cell receptor genes and immunoglobulin genes, respectively, but the possible involvement of the RAG-1 transcript in RAG-1-positive cells of the spleen and the lymph nodes in functions other than the rearrangement of genes could not be ruled out. (author).

2236 (RERF-TR–10-91) **Study of skin cancer incidence in Nagasaki atomic bomb survivors, 1958-85.** Sadamori, Naoki; Otake, Masanori; Honda, Takeo. Radiation Effects Research Foundation, Hiroshima (Japan). Mar 1993. 23p. Order Number DE94718877. Source: OSTI; NTIS; INIS.

The effects of exposure to ionizing radiation on skin cancer incidence in a cohort of atomic bomb (A-bomb) survivors in the Nagasaki Extended Life Span Study (LSS-E85) sample have been investigated. Among 25,942 exposed survivors at risk whose DS86 dose estimates were available, 47 cases of skin cancer including malignant melanoma were confirmed in the Nagasaki Tumor Registry during the period from 1 April 1958 to 31 December 1985. The dose-response relationship of skin cancer based on an additive relative risk model showed linearity without threshold, not a linear-quadratic curve. The excess relative risk (ERR) of 2.2 per gray in the LSS-E85 sample was highly significant (95% confidence limits: 0.5 to 5.0). In addition, the ERR of 3.1 per gray in the Adult Health Study (AHS) sample was also significant (95% confidence limits: 0.6 to 20.3). When dose equivalents based on a relative biological effectiveness of neutrons of 10 were used, the ERR in the former sample decreased to 2.0 per sievert (95% confidence limits: 0.7-4.5), and the risk in the latter group also declined, to 2.7 per sievert (95% confidence limits: 0.6-17.8). The ERRs did not differ significantly between males and females in the LSS-E85 and AHS samples, but a highly significant increase was observed for the ERR of age at exposure and time trend since exposure. The ERR of skin cancer cases including and excluding 4 malignant melanoma cases for the LSS-E85 sample (there were no malignant melanoma cases in the AHS sample) showed almost the same linear dose response. This is the first report to demonstrate a highly significant dose-response relationship between A-bomb exposure and skin cancer incidence. (author).

2237 (STUK-A–107) **The exposure of radiologists and patients to radiation during coronary angiography and percutaneous transluminal coronary angioplasty (PTCA): The performance of cine x-ray equipment and film processing.** Karppinen, J.; Parviainen, T. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Mar 1993. 86p. (In Finnish). Order Number DE94605626. Source: OSTI; NTIS; INIS.

The exposure of radiologists and patients to radiation during coronary angiography and percutaneous transluminal coronary angioplasty (PTCA) in Finland was studied using phantom measurements. Additional tests were made concerning the performance of TV fluoroscopy systems, cine fluorographic units and film processing. These tests include sensitometric quality control of film processing, automatic exposure control in fluoroscopy and cinefluorography, and contrast and resolution in a cine frame and TV image.

5603 Chemicals Metabolism and Toxicology

Refer also to citation(s) 81, 418, 1145, 1258, 1434, 1973, 1979, 2075

2238 (ANL/BIM/PP–75359) **Osteoporotic-like effects of cadmium on bone mineral density and content in aged ovariectomized beagles.** Sacco-Gibson, N.; Abrams, J.; Chaudhry, S.; Hurst, D.; Peterson, D.; Bhattacharyya, M. Argonne National Lab., IL (United States). [1992]. 34p. Sponsored by USDOE, Washington, DC (United States); Department of Health and Human Services, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93041159. Source: OSTI; NTIS; INIS; GPO Dep.

Our purpose was to evaluate the effects of ovariectomy in conjunction with cadmium (Cd) exposure on bone. Aged female beagles with ^{45}Ca-labeled skeletons ovariectomized and exposed to Cd. Successive vertebral scans by dual photon absorptiometry monitored changes in bone mineral density (BMD) in each dog with time. Results showed that ovariectomy or Cd exposure alone caused significant decreases in BMD; ovariectomy with Cd exposure caused the greatest decrease. Ovariectomy alone did not decrease BMD in the distal end or mid-shaft of the tibia while BMD of the distal tibia decreased significantly due to Cd exposure alone. Combination treatment resulted in significant decreases in BMD of both tibial regions. At necropsy, tibiae, humeri, lumbar vertebrae and ribs were obtained for biochemical analysis. No group-to-group differences in bone weights (wet, dry, ash), in ash/dry ratios, or in long bone and vertebral Ca/dry or Ca/ash ratios were observed. Significantly higher total ^{45}Ca content and ^{45}Ca/dry and ^{45}Ca/ash ratios were observed in long bones and vertebrae of OV- and OV+ groups. In contrast, intact ribs showed significantly decreased Ca/dry and Ca/ash ratios compared to the SO-group. Quartered ribs demonstrated regional responses to specific treatment; decreases in total Ca content were greatest in the mid-rib region (−36 to −46%). Results suggest that in the aged female beagle, bone mineral loss associated with estrogen depletion is not only related to bone type (trabecular versus cortical) but also to bone Ca pools. Our results also suggest that a regional heterogeneity of bone plays a role in responsiveness to ovariectomy and Cd exposure. These aspects suggest that Cd is an exogenous factor affecting bone mineral loss independently of estrogen depletion. However, estrogen depletion primes bone for responsiveness to Cd-induced bone mineral loss.

2239 (DOE/MC/26018–3438) **[Toxicity studies of mild gasification products]: [Quarterly report, October 1, 1992–December 31, 1992].** National Inst. for Occupational Safety and Health, Morgantown, WV (United States). [1992]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI21-89MC26018. Order Number DE94000873. Source: OSTI; NTIS; GPO Dep.

Mild gasification of coal is a technology being developed by the United States Department of Energy and private industry with the hope that a cleaner method of coal use can help meet future energy needs. As the technology develops and its commercial use becomes a more viable possibility, efforts are being made to study the safety or possible toxicity of the mild gasification products. DOE and the National Institute for occupational Safety and Health (NIOSH) are cooperating through an interagency agreement to examine some of these products for their genotoxic potential. NIOSH has studied the mutagenicity of several mild gasification product samples using the Ames Salmonella/microsomal assay. As reported earlier PSIS#830331 failed to demonstrate genotoxic activity in the Ames assay under all conditions tested. Since the mild gasification products are complex mixtures, interactions between various components are likely to occur. Such interactions between various components of complex mixtures may increase or decrease genotoxic activity in short-term assays like the Ames test. Although all synergistic interactions may not be detailed, the separate analysis of those components in several classes provides a more accurate view of the genotoxicity of each component and better allows for chemical characterization of the possible mutagens in the mixture. NIOSH has performed mutagenicity studies on the subfractions of PSIS#830331. The results of those studies are detailed in this report.

2240 (EGG-WM–10661) **Hazardous Solvent Substitution Data System reference manual: Revision 1.** Branham-Haar, K.A.; Twitchell, K.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002840. Source: OSTI; NTIS; INIS; GPO Dep.

Concern for the environment, in addition to Federal regulation, mandate the replacement of hazardous solvents with safer cleaning agents. Manufacturers are working to produce these replacement solvents. As these products are developed, potential users need to be informed of their availability. To promote the use of these new products instead of traditional solvents, the Idaho National Engineering Laboratory (INEL) has developed the Hazardous Solvent Substitution Data System (HSSDS). The HSSDS provides a comprehensive system of information on alternatives to hazardous solvents and related subjects, and it makes that information available to solvent users, industrial hygienists, and process engineers. The HSSDS uses TOPIC®, a text retrieval system produced by Verity, Inc., to allow a user to search for information on a particular subject. TOPIC® produces a listing of the retrieved documents and allows the use to examine the documents individually and to use the information contained in them. This reference manual does not replace the comprehensive TOPIC® user documentation (available from Verity, Inc.), or the HSSDS Tutorial (available from the INEL). The purpose of this reference manual is to provide enough instruction on TOPIC® so the user may begin accessing the data contained in the HSSDS.

2241 (ETDE-IT–93-219) **Notes on toxic materials: Sulfur dioxide.** Uccelli, R. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Mauro, F. 1992. 14p. (In Italian). Order Number DE94716510. Source: OSTI; NTIS (US Sales Only).

A comparative assessment is made of EPA (US Environmental Protection Agency), WHO (World Health Organization) and European Communities limits on atmospheric concentrations of sulfur dioxide. The assessment traces the history of the development of these limits and the safety criteria upon which they were based. Particular reference is made to the results of a United Nations WHO 1980-1984 monitoring campaign to determine atmospheric sulfur dioxide concentration levels in 25 major cities of the world. The paper also discusses the findings of various epidemiological studies to determine how sulfur dioxide reacts with various body organs and to establish health risks relative to short and long term exposure.

2242 (PNL–8794) **An evaluation of the environmental fate and behavior of munitions materiel (Tetryl and polar metabolites of TNT) in soil and plant systems: Environmental fate and behavior of tetryl.** Fellows, R.J.; Harvey, S.D.; Cataldo, D.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 106p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. (TD–2695). Order Number DE93041156. Source: OSTI; NTIS; GPO Dep.

The objective of the present studies was to elucidate the environmental behavior and fate of 2,4,6trintrophenylmethylnitramine (tetryl) in the soil/plant system in three different types of soils incubated for 60 days. No tetryl was detectable after 11 days; most of the radiolabel was associated with non-extractable soil components and four transformation products appeared rapidly, of which two were identified as N-methyl-2,4,6-trintroaniline and N-methyl-aminodinitroaniline isomer. Short-term hydroponic studies indicated no significant difference in uptake rates for the three plant species employed. Kinetic studies indicated that plants have a high affinity and capacity for absorbing tetryl. Partitioning patterns indicated that the root is the major accumulation site for tetryl. Chemical fractionation and analyses of tissues showed rapid metabolism of tetryl in tissues of all species, which proceeded toward more polar metabolic products. Plant maturity studies indicated significant differences in the total relative uptake of tetryl by all three plant species based on soil type.

5604 Other Environmental Pollutant Effects

Refer also to citation(s) 809

2243 (CEA-R–5432) **Lasers in research laboratories. Laser safety working group, part of the "Groupe d'Etudes de Prevention" at the "Commissariat a l'Energie Atomique" (French Atomic Energy Commission).** Der Nigohossian, G. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. Securite, Controle et Environnement. 1992. 112p. (In French). Order Number DE94700002. Source: OSTI; NTIS (US Sales Only).

The authors have examined the question of Safety with lasers and have endeavoured to provide practical information and advice based on the experience of laser users. After outlining the hazards related to the laser beam itself and its intermediate environment (electrical and chemical hazards, etc...) the Working Group examines practical aspects of work area installation and then proposes safety measures to be applied during laser adjustment and operation. The book includes numerous appendices.

57 HEALTH AND SAFETY

Refer also to citation(s) 163, 1258, 1387, 1401, 1888, 2231

2244 (CONF-9301129–1) **Warning systems and public warning response.** Sorensen, J.H. Oak Ridge National Lab., TN (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Socioeconomic aspects of disasters in Latin America; San Jose (Costa Rica); 26 Jan 1993. Order Number DE93041049. Source: OSTI; NTIS; GPO Dep.

This background paper reviews current knowledge on warning systems and human response to warnings. It expands on an earlier paper prepared for a workshop on the Second Assessment on Natural Hazards, held in Estes Park, Colorado in July 1992. Although it has a North American perspective, many of the lessons learned are universally applicable. The paper addresses warning systems in terms of dissemination and does not cover physical science issues associated with prediction and forecast. Finally, it covers hazards with relatively short lead times – 48 hours or less. It does not address topics such as long-term forecasts of earthquakes or volcanic eruptions or early famine warning systems.

2245 (LA-UR–93-3306) **Human factors issues in qualitative and quantitative safety analyses.** Hahn, H.A. Los Alamos National Lab., NM (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309215–2: Surety technology symposium, Chelyacinsk (Russian Federation), 28 Sep - 2 oct 1993). Order Number DE94000894. Source: OSTI; NTIS; GPO Dep.

Humans are a critical and integral part of any operational system, be it a nuclear reactor, a facility for assembly or disassembling hazardous components, or a transportation network. In our concern over the safety of these systems, we often focus our attention on the hardware engineering components of such systems. However, experience has repeatedly demonstrated that it is often the human component that is the primary determinant of overall system safety. Both the nuclear reactor accidents at Chernobyl and Three Mile Island and shipping disasters such as the Exxon Valdez and the Herald of Free Enterprise accidents are attributable to human error. Concern over human contributions to system safety prompts us to include reviews of human factors issues in our safety analyses. In the conduct of Probabilistic Risk Assessments (PRAs), human factors issues are addressed using a quantitative method called Human Reliability Analysis (HRA). HRAs typically begin with the identification of potential sources of human error in accident sequences of interest. Human error analysis often employs plant and/or procedures walk-downs in which the analyst considers the "goodness" of procedures, training, and human-machine interfaces concerning their potential contribution to human error. Interviews with expert task performers may also be conducted. In the application of HRA, once candidate sources of human error have been identified, error probabilities are developed.

2246 (MSHA/IR–1154) **In plant partial noise enclosures for the mining industry.** Kinevy, P.T. Mine Safety and Health Administration, Pittsburgh, PA (United States). Pittsburgh Health Technology Center. 1993. 32p. Sponsored by Department of Labor, Washington, DC (United States). Order Number DE94001244. Source: OSTI; NTIS.

The Physical and Toxic Agents Division of the Mine Safety and Health Administration's Pittsburgh Safety and Health Technology Center has conducted three joint noise control demonstrations at dry milling operations. These demonstrations were conducted on a rod mill, a roller mill, and a ball mill, in order to survey a representative sample of the more commonly utilized types of milling equipment. The noise control concept that was demonstrated involved the construction of partial enclosures surrounding the mills and then adding acoustical materials within the enclosures to absorb the build up of acoustical energy. The results of this work illustrate the feasibility of this concept, the physical principle of creating an acoustical shadow, and the ability to closely predict the amount of absorptive material required to reduce the noise levels so as to comply with the Code of Federal Regulations (CFR), Title 30.

2247 (MSHA/IR–1208) **Injury experience in metallic mineral mining, 1991.** Mine Safety and Health Administration, Denver, CO (United States). Safety and Health Technology Center. 1993. 290p. Sponsored by Department of Labor, Washington, DC (United States). Order Number DE94001245. Source: OSTI; NTIS.

This Mine Safety and Health Administration (MSHA) informational report reviews in detail the occupational injury and illness experience of metallic mineral mining in the United States for 1991. Data reported by operators of mining establishments concerning work injuries are summarized by work location, accident classification, part of body injured, nature of injury, occupation, and principal type of mineral. Related information on employment, worktime, and operating activity also is presented. Data reported by independent contractors performing certain work at mining locations are depicted separately in this report. For ease of comparison with other metal and nonmetallic mineral mining industries and with coal mining, summary reference tabulations are included at the end of both the operator and the contractor sections of this report.

2248 (MSHA/IR–1211) **Injury experience in sand and gravel mining, 1991.** Mine Safety and Health Administration, Denver, CO (United States). 1993. 114p. Sponsored by Department of Labor, Washington, DC (United States). Order Number DE94001243. Source: OSTI; NTIS.

This Mine Safety and Health Administration (MSHA) informational report reviews in detail the occupational injury and illness experience of sand and gravel mining in the United States for 1991. Data reported by operators of mining establishments concerning work injuries are summarized by work location, accident classification, part of body injured, nature of injury, and occupation. Related information on employment, worktime, and operating activity also is presented. Data reported by independent contractors performing certain work at mining locations are depicted separately in this report. For ease of comparison with other metal and nonmetallic mineral mining industries and with coal mining, summary reference tabulations are included at the end of both the operator and the contractor sections of this report.

2249 (WSRC-MS–92-235) **Site fire protection projects review board engineering evaluation.** Fayfich, R.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1992]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9206385–2: SFPE symposium on the preparation of fire hazards analysis for DOE facilities, Idaho Falls, ID (United States), 23-24 Jun 1992). Order Number DE93040182. Source: OSTI; NTIS; GPO Dep.

The Savannah River Site (SRS) has been safely operated since its beginning in the early 1950's with an effective, highly successful program of fire prevention. However, in the mid 1980's the Department of Energy directed the site to identify and install fire protection measure in addition to the reliance on prevention. To address the site needs, independent fire protection surveys were conducted by Factory Mutual Research Corporation and Professional Loss Control, Inc. in 1986 and 1987. The results of these surveys identified 1400 fire protection improvements needed in existing facilities to comply with DOE Orders and NFPA Codes and Standards.

5701 Real Accidents

Refer also to citation(s) 701, 702, 784

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Refer also to citation(s) 71, 75, 79, 95, 99, 274, 288, 332, 341, 419, 438, 591, 592, 593, 594, 606, 607, 608, 716, 804, 984, 1167, 1168, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1185, 1186, 1187, 1188, 1189, 1190, 1192, 1193, 1200, 1201, 1860, 1866, 1897, 1946, 2008, 2013, 2020, 2032, 2033, 2045, 2046, 2047, 2054, 2074, 2083, 2845

2250 (CONF-9309230–2) **Tools for visualizing landscape pattern for large geographic areas.** Timmins, S.P. (Analysas Corporation, Oak Ridge, TN (United States)); Hunsaker, C.T. Oak Ridge National Lab., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. international workshop in integrating geographic information systems and environmental modeling; Breckenridge, CO (United States); 27-29 Sep 1993. Order Number DE94001121. Source: OSTI; NTIS; GPO Dep.

Landscape pattern can be modelled on a grid with polygons constructed from cells that share edges. Although this model only allows connections in four directions, programming is convenient because both coordinates and attributes take discrete integer values. A typical raster land-cover data set is a multimegabyte matrix of byte values derived by classification of images or gridding of maps. Each matrix may have thousands of raster polygons (patches), many of them islands inside other larger patches. These data sets have complex topology that can overwhelm vector geographic information systems. The goal is to develop tools to quantify change in the landscape structure in terms of the shape and spatial distribution of patches. Three milestones toward this goal are (1) creating polygon topology on a grid, (2) visualizing patches, and (3) analyzing shape and pattern. An efficient algorithm has been developed to locate patches, measure area and perimeter, and establish patch topology. A powerful visualization system with an extensible programming language is used to write procedures to display images and perform analysis.

2251 (CONF-9310102–17) **Post-Palbozoic crustal responses to the contemporary stress field in the eastern United States.** Staub, W.P.; Hardee, H.K. Oak Ridge National Lab., TN (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993. Order Number DE93040604. Source: OSTI; NTIS; GPO Dep.

This paper summarizes the current state of knowledge with respect to post-Paleozoic tectonic features and their relationship to the contemporary stress field outside coastal plain regions of the eastern United States. Until the early 1970s very little was known about such features. By the end of 1992 post-Paleozoic faults had been observed in at least five widely separated regions. Pleistocene-Holocene surface ruptures and liquefaction features had been observed over a steadily increasing area of the upper Mississippi embayment and adjacent regions. Ages of most recent ruptures on post-Paleozoic faults range from uncertain to Holocene and their senses of motion are compatible with the contemporary stress field. The cumulative amount of post-Paleozoic displacement on these faults is generally less than three meters. Fracture systems in Paleozoic rocks also are compatible with the contemporary stress field over a wide region of Indiana.

2252 (DOE/ER/13795–T1) **Isotopic and trace element characteristics of rhyolites from the Valles Caldera, New Mexico: Final technical report.** Self, S. (Hawaii Univ., Honolulu, HI (United States). Dept. of Geology and Geophysics); Sykes, M.L.; Wolff, J.A.; Skuba, C.E. Texas Univ., Arlington, TX (United States). Dept. of Geology. Sep 1991. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-87ER13795. Order Number DE94001653. Source: OSTI; NTIS; GPO Dep.

This report is a summary of work supported by DOE grant No. DE-FG05-87ER13795 that was completed or is still in progress. The stated purpose of this grant was to collect geochemical information (trace element, radiogenic isotope and stable oxygen and hydrogen isotope) on samples from core holes VC-I and VC-2a in the Valles caldera in order to establish a consistent detailed intracaldera stratigraphy and relate this to extracaldera volcanic rock units of the Jemez Mountains. Careful stratigraphic control of the intracaldera units is necessary to evaluate models of caldera formation, ignimbrite deposition, and resurgence. Combined stable and radiogenic isotope and trace element data will also provide major insights to petrogenesis of the Bandelier magma system. The composition of non-hydrothermally altered samples from outflow units of the Bandelier Tuff and related volcanics must be known to assess isotopic variations of intracaldera ignimbrite samples. On detailed examination of the VC-2a core samples, it became apparent that hydrothermal alteration is so extensive that no geochemical information useful for stratigraphic fingerprinting or petrogenesis could be obtained, and that correlation with other intracaldera units and extracaldera units must be made on the basis of stratigraphic position and gross lithologic characteristics. Accordingly, we emphasize geochemical data from the extracaldera Bandelier Tuffs and related units which will be useful for comparison with proposed drill hole VC-4 and for any future studies of the region. The stable isotope, radiogenic isotope and trace element data obtained from this project, combined with existing major and trace element data for volcanic rocks from this area, provide an extensive data base essential to future Continental Scientific Drilling Program projects in the Jemez Mountains of New Mexico.

2253 (DOE/ER/14061–2) **Board on earth sciences and resources: Progress report, 1 September 1991–31 August 1993.** National Academy of Sciences, Washington, DC (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER14061. Order Number DE94000745. Source: OSTI; NTIS; GPO Dep.

During the past year, working groups of the committee have reviewed and reported on the status of regional networks, and wrote a report on the real-time warning of earthquakes. The field of seismology is going through revolutionary changes with new measurement capabilities, new analytical capabilities, and new understanding of earthquake processes at hand are still evolving. Earthquake "gaps" are recognized as diagnostic elements for focusing on future large earthquakes; regional and national networks are under intense study, and future directions for them are emerging; and large scientific projects are under way in seismology which will bring new insights into earth structure, wave propagation, and earthquake processes. Ground motions and recurrence rates of earthquakes are major factors in the assessment of earthquake hazards, and improvements in both factors are badly needed. The Committee on Seismology will continue to review progress and needs for research on strong ground motions.

2254 (DOE/ER/14079–27) **Dynamic ray tracing and its application in triangulated media.** Rueger, A. Colorado School of Mines, Golden, CO (United States). Center for Wave Phenomena. Jul 1993. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER14079. (CWP–139). Order Number DE94000875. Source: OSTI; NTIS; GPO Dep.

Hale and Cohen (1991) developed software to generate two-dimensional computer models of complex geology. Their method uses a triangulation technique designed to support efficient and accurate computation of seismic wavefields for models of the earth's interior. Subsequently, Hale (1991) used this triangulation approach to perform dynamic ray tracing and create synthetic seismograms based on the method of Gaussian beams. Here, I extend this methodology to allow an increased variety of ray-theoretical experiments. Specifically, the developed program GBmod (Gaussian Beam MODeling) can produce arbitrary multiple sequences and incorporate attenuation and density variations. In addition, I have added an option to perform Fresnel-volume ray tracing (Cerveny and Soares, 1992). Corrections for reflection and transmission losses at interfaces, and for two-and-one-half-dimensional (2.5-D) spreading are included. However, despite these enhancements,

difficulties remain in attempts to compute accurate synthetic seismograms if strong lateral velocity inhomogeneities are present. Here, these problems are discussed and, to a certain extent, reduced. I provide example computations of high-frequency seismograms based on the method of Gaussian beams to exhibit the advantages and disadvantages of the proposed modeling method and illustrate new features for both surface and vertical seismic profiling (VSP) acquisition geometries.

2255 (DOE/OR/22089–2) **Annotated bibliography hydrogeology of Kilauea Volcano, Hawaii.** Ingebritsen, S.E.; Scholl, M.A. Geological Survey, Menlo Park, CA (United States). [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-93OR22089. (USGS-OFR–93-551-D). Order Number DE94001613. Source: OSTI; NTIS; GPO Dep.

The report consists of report documentation and short abstracts relating to the hydrology, geology, rainfall, ground water, water table and evapotranspiration, etc. relating to the whole island.

2256 (ETDE/JP-mf–94714705, pp. 55-103) **Magma behavior and eruption as seen from earthquake.: Towards elucidation of eruptive mechanism of volcano in White Island.** Sugihara, M.; Nishi, Y. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper takes an outline view of the general image of volcanoes as revealed by seismic data. The paper first mentions on deep structure of a volcano that the presence of a low-speed region thought to correspond to mantle diapir, and a hypocentral region of low-frequency earthquake has been found, so has been the presence of low-speed abnormality corresponding to a magma reservoir and an S-wave reflection plane. It then summarizes on volcanic earthquakes, particularly relating to explosive earthquakes, studies on air shock comparative studies on explosive earthquakes with low-frequency earthquakes and volcanic tremors, and studies on hypocentral processes in explosive earthquakes (single force model). It states that an explosive earthquake corresponds to a case of the large-scale low-frequency earthquake called a type-B earthquake. Finally, it introduces analyses and considerations on eruptions and associated earthquakes in the volcanoes in the White Island, New Zealand, and a model for the generation mechanism of eruptions of volcanoes in the Izu-Oshima Island (eruptive activities are controlled by behavior of steam dissolved into magma). 104 refs., 15 figs., 1 tab.

2257 (ETDE/JP-mf–94714705, pp. 107-118) **Roles of volatile components in magma ascent and eruption.: Example of an Izu-Oshima Island volcano.** Kazahaya, K. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper describes roles of volatile components (H2O and CO2) in magma ascent and eruption, taking the Izu-Oshima Island volcano as an example. At the volcano, in order for the magma to ascend from a magma reservoir in resistance to a presence of the thick foundation on the crust surface (with a density of 2.4 g/cm^3), a bulk density of volatile components must be reduced by about 10% as a result of foaming and expansion of the components. With the magma in the said volcano with less H2O content (less than 0.7% by weight), the foaming pressure is governed by CO2, where a CO2 content of more than 0.4% by weight is needed for an eruption to occur. The following models are proposed on eruptive activities in the Izu-Oshima Island: Bubbles of CO2 are concentrated in the magma reservoir under some kind of process, and eruption of lava spring occurs; CO2 decreases to below 0.1% by weight, when the eruption form transfers to lava lake building activities; gases escape out from magma in the magma reservoir, when the eruptive activities end; and large quantities of degassed magma form intrusive rocks. 21 refs., 6 figs.

2258 (ETDE/JP-mf–94714705, pp. 121-132) **Mechanism for magma vapor explosion.** Yamamoto, T. Geological Survey of Japan, Tsukuba, Ibaraki (Japan). Dec 1992. 275p. (In Japanese). In *Interim report on 1991/1992 research and development results under the Sunshine Project.: Study on technologies to evaluate national geothermal resources.* Order Number DE94714705. Source: OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan.

This paper summarizes a mechanism for magma vapor explosion. For a vapor explosion to occur as a result of high-temperature fluid contacting low-temperature low-boiling point liquid, it is indispensable that the contact area be increased through refining of the high-temperature fluid. When lava erupted out on the ground contacts surface water, a vitreous film is formed on the lava surface. Magma vapor explosion can occur from interactions between moisture containing debris in volcanic vents and the magma. Magma refining may include the following two mechanisms: One is an explosion triggered from mechanical mixing of fluid magma with moisture containing debris resulting from instability in fluid boundaries, wherein the magma is fractured hydrodynamically by the expanding high-pressure steam; and the other is spontaneous fracture because of magma foaming. The paper describes that the difference between these two mechanisms is reflected in the states of volcanic ashes generated by the explosion, and which of the mechanisms becomes predominant depends on the depth of the point where a reaction is triggered in the volcanic vent. 40 refs., 4 figs.

2259 (EUR–13341) **Borehole measurements at great depth: availability and limits of logging tools.** Haenel, R. (Niedersaechsisches Landesamt fuer Bodenforschung, Hannover (Germany)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. 88p. Contract JOUG-0001-D. Source: OSTI; NTIS (US Sales Only).

The continental crust, supplying mankind with raw materials and energy but at the same time endangering it with earthquakes and volcanoes, has not been sufficiently explored. In the past two decades, therefore, major crust exploration programmes have been started. Control of the results thus obtained, however, is possible only by means of deep boreholes. An increasing number of boreholes is now being drilled both for prospecting and for geoscientific purposes. The knowledge to be gained from a borehole is obtained either from the rock material recovered from it or from downhole measurements or, better, from both these methods. For reasons of economy, generally only a few drill cores are taken, and borehole measurements are performed instead. Deep borehole logging is therefore especially important. (author). 33 refs., 48 figs., 10 tabs.

2260 (LA-UR–92-310) **Geologic mapping of the Semipalatinsk region, Eastern Kazakstan, using Landsat Thematic Mapper and spot panchromatic data.** Davis, P.A. (Geological Survey, Flagstaff, AZ (United States)); Berlin, G.L. Los Alamos National Lab., NM (United States). [1992]. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040507. Source: OSTI; NTIS; GPO Dep.

This geologic reconnaissance study centers on a 90 by 140 km area about 100 km southwest of Semipalatinsk near the east border of the Kazakstan Republic of the USSR. Semipalatinsk, a regional center for grain growing, and several other cities along the Irtysh River were originally established as fortified outposts by the Russians during the 18th and 19th centuries to contain the indigenous, nomadic Kazak herdsmen. The Kazakstan region remained largely undeveloped until after the 1917 Russian Revolution, when exploration geologists began discovering many large mineral deposits. Today, known resources include coal, copper, iron ore, lead, zinc, and barite; most of these are of national significance. These vast mineral resources have prompted development of many metallurgical and chemical industries in the republic. Despite the extensive exploration for mineral resources in this region, published geologic maps (Nalivkin, 1960; Esenov, 1971; Borovikov, 1972) are all at scales of 1:1,100,000 or smaller, and there are no detailed descriptions of the geology around Semipalatinsk in the

open literature. Our preliminary examination of commercial remote-sensing, data indicated that the lithology and structure of this area are extremely varied and complex at all scales – much more so than that portrayed on the published geologic maps. Therefore, the main objective of this study was to use commercially available remotely sensed data for the area and remotely sensed data obtained for analog study sites, as well as the sparse, sketchy information in the published literature, to better define and map the geologic units (Sheet 1), structure (Sheet 2), and drainage features (Sheet 3) of this area.

2261 (LA-UR–93-3330) **An exact renormalization model for earthquakes and material failure: Statics and dynamics.** Newman, W.I. (California Univ., Los Angeles, CA (United States)); Gabrielov, A.M.; Durand, T.A.; Phoenix, S.L. Los Alamos National Lab., NM (United States). 12 Sep 1993. 41p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant EAR-91-04624. (CONF-9305289–1: Center for Nonlinear Studies international conference on modeling the forces of nature, Los Alamos, NM (United States), 17-21 May 1993). Order Number DE94000775. Source: OSTI; NTIS; GPO Dep.

Earthquake events are well-known to prams a variety of empirical scaling laws. Accordingly, renormalization methods offer some hope for understanding why earthquake statistics behave in a similar way over orders of magnitude of energy. We review the progress made in the use of renormalization methods in approaching the earthquake problem. In particular, earthquake events have been modeled by previous investigators as hierarchically organized bundles of fibers with equal load sharing. We consider by computational and analytic means the failure properties of such bundles of fibers, a problem that may be treated exactly by renormalization methods. We show, independent of the specific properties of an individual fiber, that the stress and time thresholds for failure of fiber bundles obey universal, albeit different, staling laws with respect to the size of the bundles. The application of these results to fracture processes in earthquake events and in engineering materials helps to provide insight into some of the observed patterns and scaling-in particular, the apparent weakening of earthquake faults and composite materials with respect to size, and the apparent emergence of relatively well-defined stresses and times when failure is seemingly assured.

2262 (LA-UR–93-3353) **Mineralogical characteristics of the silica polymorphs in relation to their biological activities.** Guthrie, G.D. Jr. (Los Alamos National Lab., NM (United States)); Heaney, P.J. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310184–1: Symposium on silica, silicosis, and cancer, San Francisco, CA (United States), 28-30 Oct 1993). Order Number DE94000772. Source: OSTI; NTIS; GPO Dep.

Numerous aspects of minerals (including the silica polymorphs) can effect their biological activities. These include periodic structures, compositional variations, dissolution characteristics, surface properties, and particle size/shape. In order to understand mineral-induced pathogenesis in a mechanistic way, the links between these properties and biochemical processes must be elucidated. This paper presents some of the basic properties of the silica polymorphs that may relate to pathogenicity and mineralogical strategies for designing biological assays to evaluate these properties.

2263 (NHP–32) **Use of digital geographical databases in hydrological modeling.** Andersson, L.; Hassel, K.A. (eds.). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. 158p. (In English, Swedish, Danish). (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

Separate abstracts were prepared for 9 papers of this conference.

2264 (NHP–32, pp. 29-34) **Use of digital geographical data bases for hydrological modeling in Finland.** Ekholm, M. (Hydrological Office, Helsinki (Finland)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

The demands placed on hydrological models have increased considerably in recent times. The use of the geographic information system as the base of parameter production has for the first time given an opportunity to handle the real-time control of runoff model parameters in operational watershed forecasting.

2265 (NHP–32, pp. 35-45) **Use of digital geographical data bases for hydrological modeling in Norway.** Faanes, T. (Norsk Hydroteknisk Lab., Trondheim (Norway)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

A questionnaire covering the use of digital geographical databases for hydrological and hydrochemical modeling was sent to approximately 100 institutions in Norway. This paper gives a summary of the answers. 30% answered the questions, and among them were governmental authorities, universities, country and municipality administrations, and some private companies. 16 have some experience in us of geographical information systems (GIS), 14 have no GIS and have no plans for the early future to use GIS. This report do not intend to be complete, but will give a general survey of what is going on and where it is done in Norway in 1991 and early 1992. The use of GIS is still in its beginning, and some institutions consider to make use of GIS in the near future. 4 tabs.

2266 (NHP–32, pp. 47-54) **Use of digital geographical data bases for hydrological modeling in Sweden.** Jutman, T. (Swedish Meteorological and Hydrological Inst., Norrkoeping (Sweden)); Andersson, L. Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

The facilities of a geographical information system (GIS) can be used for handling, analysis, and presentation of spatial, and to some degree also of temporal information. Within water resources planning and management, large amounts of spatially and temporally distributed information must be handled and analysed. Information from different sources and of different types has to be integrated. The introduction of GIS into water resources planning and management has therefore formed a basis for development of new techniques. Within the field of hydrological/hydrochemical modeling there is an increasing interest in different categories of distributed models. Many initial problems of distributed models were related to lack of availability of spatial information. From this followed uncertainty in the determination of a vast number of model parameters. The ability to extract information of spatial parameters from available digital maps is one tool that makes distributed modeling practicable. This paper gives a brief overview of the current use of GIS and geographical databases for hydrological modeling in Sweden. The information is based on a questionnaire sent out to relevant governmental authorities, universities, county and municipality administrations, and to a few private companies active within the field of environmental modeling. 2 refs.

2267 (NHP–32, pp. 57-64) **Data bases at Department of Land Data (ADK) - their use and future requirements.** Mielby, S. (Dept. of Land Data. The Danish Inst. for Plant and Soil Science. Ministry of Agriculture (Denmark)); Platou, S.W.; Stjernholm, M. Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992).

In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

The Danish Department of Land Data (ADK) aims at research in modeling impact of agriculture practices on the environment in a regional scale. Special interest is made in the basic data acquisition including the problems of delineating different land use areas and monitoring agriculture crops. A number of region and local data bases has been extensively used since 1980 in tasks concerning groundwater, streams and lakes. Although a very large amount of data is available, the problems to be solved are of increasing complexity and constantly requires more detailed information. Therefore better data bases concerning surface, subsurface soil and geological conditions are under development. A major factor, influencing the water quality, is land use and actual land cover. At present ADK performs a land-cover mapping of Denmark by application of remote sensing (as a part of the EEC CORINE project). In the following the background for the establishment of the existing data bases is described. Besides new data bases under development and future data bases are described. The general tendency of doing detailed investigation in small test areas, later to be followed by modeling on larger regions, give rise to a number of problems. The problems are connected to the content and quality of the regional data, especially when many different data bases are aggregated. Some examples of these problems will be given. 5 refs.

2268 (NHP–32, pp. 65-70) **Q-Vadis - A geographical information system (GIS) for monitoring the environmental situation of watercourses.** Larsson, P. (Lantmaeteriverket, Gaevle (Sweden)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (In Swedish). (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

Q-Vadis is a prototype system which has been developed to demonstrate how geographical information system (GIS) technology can be used to monitor the environmental situation in rivers and watersheds. The main objectives have been to gain experience and formulate guidelines for the development of an operational system in the future, to evaluate the extent to which data from various databases can be merged and processed to provide environmental information about rivers and water bodies and about the factors which influence their condition, and finally to increase the knowledge about GIS for this type of application. The system was developed in a UNIX-workstation using ARC/INFO and GRASS software. The main functions and the testing of the system are described. 6 refs.

2269 (NHP–32, pp. 75-80) **The use of digital geographical data bases when calculating river discharge at the Swedish Meteorological and Hydrological Institute (SMHI).** Lindkvist, T. (Swedish Meteorological and Hydrological Inst., Norrkoeping (Sweden)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (In Swedish). (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

The HBV/PULS model is used at the Swedish Meteorological and Hydrological Institute (SMHI) to calculate river discharge. To run the model information on precipitation, air temperature and geography is needed as input. The geographical data needed is total drainage area, mean height of total drainage area, total water area and, for each chosen height interval, the total area, forested area as well as open ground. A system called Integrated Hydrological Model System (IHMS) has been developed to run the model for any position along Swedish river calculating the discharge. Information and routines from relational data bases and geographical information system (GIS) is used to produce data files with geographical information for input to the model. IHMS is presently being used at more than 400 places in Sweden. 4 figs., 1 tab.

2270 (NHP–32, pp. 81-84) **A geographical system as data base for surface runoff models.** Lohvansuu, J. (Hydrological Office, National Board of Waters and the Environment, Helsinki (Finland)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

This paper discusses the possibilities of using a geographic information system in producing parameters for different types of surface runoff models. Spatial information is today available on the basis of geographical information system (GIS) and remote sensing data. The information consists of spatial parameters such as topography, soil types and numerical drainage. Distributed runoff models can successfully use these data sources. It is also possible in the near future that the installation of weather radar systems covering many relevant watersheds will provide real time rainfall data with high resolution in space and time. 2 figs.

2271 (NHP–32, pp. 85-88) **Hydrological applications of geographical information systems (GIS) at the Norwegian Water Resources and Energy Administration (NVE).** Voksoe, A. (The Norwegian Water Resources and Energy Administration (NVE), Oslo (Norway)). Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

This paper presents a pilot project carried out by the Norwegian Water Resources and Energy Administration (NVE) on the use of a geographical information system (GIS) to determine various hydrological parameters. A drainage basin on the west coast of Norway was chosen as a test area and parameters and runoff were calculated. The spatial data which are available in vector and raster form in Norway are also described, as well as how NVE's GIS is operated and what kind of problems it is intended to solve. 2 tabs.

2272 (NHP–32, pp. 101-112) **Digital elevation models (DEMs) for topographical modeling at different scales.** Michelson, D.B. (Dept. of Physical Geography. Univ. of Lund (Sweden)); Pilesjoe, P. Norges Forskningsraad, Oslo (Norway). Avd. NAVF. 1993. (CONF-9211272–: Use of digital geographical databases in hydrological modeling. Nordic workshop, Linkoeping (Sweden), 9-10 Nov 1992). In *Use of digital geographical databases in hydrological modeling.* 158p. Order Number DE94709722. Source: OSTI; NTIS.

Nordic Hydrological Programme.

Methods for calculating and comparing gradients, aspects, slope lengths and sizes and shapes of drainage basins derived from maps of different scales and interpolated to digital elevation models (DEMs) within different pixel sizes are presented, applied and evaluated. Comparisons are made of generated topographical factors based on maps of three different scales for an area in central Ethiopia. Among the conclusions are that gradient calculated from DEMs, created from topographical maps of different scales, should not be used in the same study if not calibrated with each other. It is also strongly indicated that one should be restrictive in using aspects calculated from DEMs with different pixel sizes in the same study. When adapting formulas or models including gradient and/or aspect values, the same map scale as when the model was established should be used. Significant differences were determined among both slope lengths and drainage basins derived from maps of different scales. An example of how the same methods can be applied in modeling simple wetlands in Swedish conditions is also given and preliminarily evaluated. It is concluded that the presented approach shows promise as a component in a geographical information system (GIS) for modeling potential wetlands. 13 refs., 5 figs., 2 tabs.

2273 (SAND–92-1810) **Unconfined compression experiments on Topopah Spring Member tuff at 22°C and a strain**

rate of 10^{-9} s^{-1}: Data report: Yucca Mountain Site Characterization Project. Martin, R.J. III (New England Research, Inc., White River Junction, VT (United States)); Boyd, P.J.; Noel, J.S.; Price, R.H. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94000346. Source: OSTI; NTIS; INIS; GPO Dep.

Experiment results are presented for unconfined compressive strength and elastic moduli of tuffaceous rocks from Busted Butte near Yucca Mountain, Nevada. The data have been compiled for the Yucca Mountain Site Characterization Project Site and Engineering Properties Data Base. Experiments were conducted on water-saturated specimens of the potential nuclear waste repository horizon Topopah Spring Member tuff (thermal/mechanical unit TSw2). The influence of strain rate on mechanical properties of the tuff was examined by loading six specimens in uniaxial compression at a strain rate of 10^{-9} s^{-1}. The experiments performed under ambient pressure and temperature conditions and conformed to Technical Procedure 91, titled "Unconfined Compression Experiments at 22°C and a Strain Rate of 10^{-9} s^{-1}." The mean and standard deviation values of ultimate strength, Young's modulus and Poisson's ratio determined from these experiments are 85.4±21.7 MPa, 33.9±4.6 GPa, and 0.09±0.07, respectively.

2274 (UCRL-JC–113406) **Shock temperature measurements of iron to 350 GPa.** Yoo, C.S.; Holmes, N.C.; Ross, M.; See, E. Lawrence Livermore National Lab., CA (United States). Jul 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–54: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001058. Source: OSTI; NTIS; GPO Dep.

Shock temperatures of iron have been measured to 350 GPa, using high quality well-characterized iron films deposited on diamond substrates. The authors have found an inflection in the (P,T)-iron Hugoniot between 250 GPa and 300 GPa, indicating iron melting at 6,350 K and 6,720 K, respectively. An extrapolation yields the iron melting temperature of 6,870 (±500) K at 330 GPa, the pressure of the Earth inner core-outer core boundary. In this paper, they present this new iron melting data together with a brief description of the experimental method to measure the shock temperatures of iron.

2275 (UCRL-JC–113803) **Modification of fracture transport properties of rocks by mechanical and chemical processes.** Durham, W.B.; Bonner, B.P. Lawrence Livermore National Lab., CA (United States). May 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305275–2: Office of Basic Energy Sciences (BES) workshop on rock fracture, Albuquerque, NM (United States), 13-14 May 1993). Order Number DE94000305. Source: OSTI; NTIS; GPO Dep.

This project aims to understand the hydraulic and mechanical properties of individual fractures in crustal rock, for the ultimate purpose of providing a basis for understanding the behavior of rock masses, which are systems of joints and fractures. We seek to measure relationships between applied normal stress, joint normal deformation, joint fluid conductivity, and joint shape. In addition to understanding joint closure and hydraulics under load, we also hope to identify processes by which joins are modified or resist modification over long times scales, in order to understand, for instance, how is it that fractures large enough to conduct fluids can exist at great depths in the crust.

2276 (UCRL-JC–115013) **3-D chemical transport model development.** Rotman, D.; Wuebbles, D.J.; Penner, J.E.; Tannahill, J.; Bergmann, D.; O'Connor, C. Lawrence Livermore National Lab., CA (United States). 11 Mar 1993. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303225–1: CHAMMP science meeting, Monterey, CA (United States), 15-17 Mar 1993). Order Number DE94000406. Source: OSTI; NTIS; GPO Dep.

Efforts during the first year of the project were directed in three primary components. First was the development and implementation of a highly accurate advection transport model on both a UNIX workstation and a massively parallel computer. Secondly, we began the investigation and comparison of Eulerian and Lagrangian transport approaches and algorithms using an existing three dimensional tropospheric chemical transport model. Thirdly, we studies the parallelization capability of strict chemistry solutions. Throughout the year, we performed calculations showing the importance and need for the inclusion of atmospheric chemistry in models that try to predict or interpret climate and climate change. This not will describe each of these efforts in more detail.

2277 (UCRL-JC–115113) **Potential role of seismic base isolation in the DOE.** Sommer, S.C. Lawrence Livermore National Lab., CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310102–16: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE93040551. Source: OSTI; NTIS; GPO Dep.

For nearly two decades, the United States Department of Energy (DOE) has substantially increased its efforts to reduce the effects of earthquakes on its facilities. Traditional means within the DOE for designing or retrofitting structures to mitigate earthquake effects include strengthening and anchoring. A nontraditional and an increasingly popular concept for mitigating the effects of earthquakes on structures is seismic base isolation. Because base isolation is emerging as a promising technology for mitigating seismic effects, its potential role in the DOE must be evaluated. In order to use the technology within the DOE, criteria and guidance need to be developed since base isolation may provide a viable design option for mitigating the effects of earthquakes on DOE facilities. This paper discusses the fundamentals of seismic base isolation, applications of the technology, and how the technology might be applied within the DOE. The future involvement of the DOE in base isolation will be part of its efforts to be a leader in meeting the Federal requirements for seismic safety.

2278 (WHC-SA–1764) **Late Cenozoic structure and stratigraphy of south-central Washington.** Reidel, S.P. (Westinghouse Hanford Co., Richland, WA (United States). Geosciences Group); Campbell, N.P.; Fecht, K.R.; Lindsey, K.A. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ;FG06-91ER14172. Order Number DE94002483. Source: OSTI; NTIS; INIS; GPO Dep.

The structural framework of the Columbia Basin began developing before Columbia River Basalt Group (CRBG) volcanism. Prior to 17.5 Ma, the eastern part of the basin was a relatively stable area, with a basement of paleozoic and older crystalline rock. The western part was an area of subsidence in which large volumes of sediment and volcanic rocks accumulated. Concurrent with eruption of the CRBG, anticlinal ridges of the Yakima Fold Belt (YFB) were growing under north-south compression. Topographic expression of these features was later masked by the large volume of CRBG basalt flowing west from fissures in the eastern Columbia Basin. The folds continued to develop after cessation of volcanism, leading to as much as 1,000 m of structural relief in the past 10 million years. Post-CRBG evolution of the Columbia Basin is recorded principally in folding and faulting in the YFB and sediments deposited in the basins. The accompanying tectonism resulted in lateral migration of major depositional systems into subsiding structural lows. Although known late Cenozoic faults are on anticlinal ridges, earthquake focal mechanisms and contemporary strain measurements indicate most stress release is occurring in the synclinal areas under north-south compression. There is no obvious correlation between focal mechanisms for earthquakes whose foci are in the CRBG and the location of known faults. High in situ stress values help to explain the occurrence of microseismicity in the Columbia Basin but not the pattern. Microseismicity appears to occur in unaltered fresh basalt. Faulted basalt associated with the YFB is highly brecciated and commonly altered to clay. The high stress, abundance of ground water in confined aquifers of the CRGB, and altered basalt in fault zones suggest that the frontal faults on the anticlinal ridges probably have some aseismic deformation. 85 refs.

66 PHYSICS

Refer also to citation(s) 2421

2279 (INIS-SU–327/A) **Direct photons in experiment polex.** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1990. 455p. (CONF-8909270–: 3. workshop on high energy spin physics, Protvino (USSR), 5-7 Sep 1989). Order Number DE93615286. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2280 (INIS-SU–338) **Experimental and theoretical physics.** AN SSSR, Moscow (Russian Federation). Fizicheskij Inst. 1990. 44p. (In Russian). Order Number DE93616653. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

6611 Classical and Quantum Mechanics

Refer also to citation(s) 2313

2281 (CONF-931115–12) **The quantum structure of matter grand challenge project: Large-scale 3-D solutions in relativistic quantum dynamics.** Wells, J.C. (Oak Ridge National Lab., TN (United States)); Oberacker, V.E.; Umar, A.S.; Bottcher, C.; Strayer, M.R.; Drake, J.; Flanery, R. Oak Ridge National Lab., TN (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Supercomputing conference on high performance computing and communications; Portland, OR (United States); 15-19 Nov 1993. Order Number DE94000328. Source: OSTI; NTIS; INIS; GPO Dep.

We describe the numerical methods used to solve the time-dependent Dirac equation on a three-dimensional Cartesian lattice. Efficient algorithms are required for computationally intensive studies of nonperturbative relativistic quantum dynamics. Discretization is achieved through the lattice basis-spline collocation method, in which quantum-state vectors and coordinate-space operators are expressed in terms of basis-spline functions on a spatial lattice. All numerical procedures reduce to a series of matrix-vector operations which we perform on the Intel iPSC/860 hypercube, making full use of parallelism. We discuss our solutions to the problems of limited node memory and node-to-node communication overhead inherent in using distributed-memory, multiple-instruction, multiple-data stream parallel computers.

2282 (IFVE-OMVT–92-119) **Miln equation for the calculation the phases and amplitudes of wave functions for continium spectrum of coulomb two-center problem.** Puzynin, V.I. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 14p. (In Russian). Order Number DE94606292. Source: OSTI; NTIS (US Sales Only); INIS.

Statement of boundary problem proposed for solving the quantum mechanics two-center problem for continuum spectrum. The solution of Schroedinger radial equation is based as the solution the Miln equation. An effective algorithm and its programm realization is given for quickly and accuraty calculation of the wave function phases and for a continuum spectrum. The results of numerical computations are presented for some parameters and compared with other analogues results. 18 refs.; 2 figs.; 6 tabs.

2283 (IHEP-OTF–92-85) **Pseudoclassical description of the massive spinning particle in d dimensions.** Plyushchaj, M.S. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 11p. Order Number DE94606293. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Phys. Lett. B.

Through the dimensional reduction of the pseudoclassical lagrangian for a massless d+1-dimensional spinning particle, the modified lagrangian for a massive spin-1/2 particle in d dimensions is constructed, which turns out to be classically equivalent to the ordinary N=1 worldline supersymmetric lagrangian. The quantization of the modified system in d=2n+1 is shown to lead, unlike the ordinary pseudoclassical model, exactly to the (2n+1)-dimensional Dirac equation, whereas in an even d=2n the two systems are also equivalent at the quantum level and describe the states, obeying the 2n-dimensional Dirac equation. 19 refs.

2284 (IHEP-OTF–92-96) **Tachyonless models of relativistic particles with curvature and torsion.** Kuznetsov, Yu.A.; Plyushchaj, M.S. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 11p. Order Number DE94606294. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of construction (2+1)-dimensional tachyonless models of relativistic particles with an action depending on the world-trajectory curvature and torsion is investigated. The special class of models, described by maximum symmetric action and comprising only spin internal degrees of freedom is found. The examples of systems from the special class are given, whose classical and quantum spectra contain only massive states. 23 refs.

2285 (INIS-mf–13714, pp. 353-356) **The classical dimensions of a photon.** Trunecek, V. (T.G. Masaryk University, Brno (Czech Republic). Faculty of Science). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology*. 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Analytic formulas for the electromagnetic field and the energy of a single photon are derived using classical Maxwell electrodynamics. Cylindrical coordinates are used, which express well the rectilinear propagation of light and its corpuscular character. Within the framework of the model described, it is possible to explain all the observed features of photon behavior, and to calculate its energy and the spatial distribution of its electromagnetic field. It is shown that in free space the photon energy is stable within a small volume for an infinite period of time. (J.U.) 8 refs.

2286 (INIS-UA–0001, pp. 146-163) **Time analysis of tunnelling processes, and possible applications in nuclear physics.** Ol'khovskij, V.S. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Recami, E. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics*. Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The aims of this paper a comparative analysis of the various, known definitions for the tunnelling durations; and the introduction of a possible, rigorous way for theoretically evaluating the time spent by a particle inside a potential barrier: with the final presentation of some peculiarities of the tunnelling process time evolution.

2287 (INP-MSU–92-33-282) **Dissipative quantum dynamics and nonlinear sigma-model.** Tarasov, V.E. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 24p. (NIIYaF-MGU–92-33-282.). Order Number DE94606295. Source: OSTI; NTIS (US Sales Only); INIS.

Sedov variational principle which is the generalization of the least action principle for the dissipative and irreversible processes and the classical dissipative mechanics in the phase space is considered. Quantum dynamics for the dissipative and irreversible processes is constructed. As an example of the dissipative quantum theory the nonlinear two-dimensional sigma-model is considered. The conformal anomaly of the energy momentum tensor trace for closed bosonic string on the affine-metric manifold is investigated. The two-loop metric beta-function for nonlinear dissipative sigma-model was calculated. The results are compared with the ultraviolet two-loop conterterms for affine-metric sigma model. 71 refs.

2288 (JINR-D–2-92-147) **Retarded distances and the Doppler effect.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 6p. Order Number DE94606296. Source: OSTI; NTIS (US Sales Only); INIS.

A relativistic transformation of the retarded distance is presented. Arguments of general nature in favour of the concept of the relativistic (radar) length leading to this formula are presented. 10 refs.

2289 (JINR-E-2-92-160) **On the importance of the Michelson-Morley experiment.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 8p. Order Number DE94606298. Source: OSTI; NTIS (US Sales Only); INIS.

The opinion of an important role of the Michelson-Morley experiment in the establishment of the pronciple oof the light velocity constancy is expressed. It is stressed that the used of radar length for the treatment of the Michelson-Morley experiment leads to the elongation formulas for the longitudinal arm of an interferometer. 24 refs.

2290 (JINR-E-2-92-440) **Quasipotential in the fourth order of perturbation theory: Uniqual mass case.** Bojkova, N.A. (Saratovskij Gosudarstvennyj Univ., Saratov (Russian Federation)); Dvoeglazov, V.V.; Tyukhtyaev, Yu.N.; Faustov, R.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 6p. Order Number DE94606299. Source: OSTI; NTIS (US Sales Only); INIS.

The quasipotential in the fourth order of perturbation theory is calculated in the Coulomb gauge for the unequal mass particles. It could be used for the future calcuiations of energy spectra in two-body systems. 15 refs.; 1 fig.

2291 (JINR-E-2-92-506) **A method for obtaining quantum doubles from the Yang-Baxter R-matrices.** Vladimirov, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 7p. Order Number DE94606300. Source: OSTI; NTIS (US Sales Only); INIS.

The approach is developed earlier that enables one to associate a quasitriangular Hopf algebra to every regular invertible constant solution of the quantum Yang-Baxter equations. 8 refs.

2292 (JINR-E-4-93-94) **The three-dimensional hydrogen atom in crossed magnetic and electric fields.** Melezhik, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 20p. Order Number DE94606301. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Rev., A Gen. Phys.

We give a solution of the three-dimensional Schroedinger equation for the electron of a hydrogen atom in external electric and magnetic fields of arbitrary mutual orientation. The rearrangement of the energy spectrum due to changing in the mutual orientation of the fields is evaluated by using n=2 multiplet as an example. The calculations agree with the second-order perturbation formulae that exist for the special cases of mutually parallel and orthogonal fields. For another special two-dimensional case which is currently being extensively investigated, namely the hydrogen atom in a strong magnetic field, our approach agrees with advanced calculations by other authors and yields more accurate binding energies for certain of the low-lying excited states that have been considered. 35 refs.; 3 figs.; 7 tabs.

2293 . (JINR-E-5-92-202) **Calculation of eigenvalues of Schroedinger operators for arbitrary coupling.** Yukalova, E.P.; Yukalov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 14p. Order Number DE94606302. Source: OSTI; NTIS (US Sales Only); INIS.

The method of self-similar approximations is applied for calculating the eigenvalues of Schroedinger operators. In this method the self-similar approximation sis theated to be a fixed-point of a self-similar mapping. 10 refs.; 2 tabs.

2294 (JINR-E-11-92-357) **Numerical solution of the multichannel scattering problem.** Korobov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 10p. Order Number DE94606297. Source: OSTI; NTIS (US Sales Only); INIS.

A numerical algorithm for solving the multichannel elastic and inelastic scattering problem is proposed. The starting point is the system of radial Schroedinger equations with linear boundary conditions imposed at some point $R=R_m$ placed somewhere in asymptotic region. It is discussed how the obtained linear equation can be splitted into a zero-order operator and its pertturbative part. It is shown that Lentini - Pereyra variable order finite-difference method appears to be very suitable for solving that kind of problems. The derived procedure is applied to $d\mu+t \rightarrow t\mu+d$ inelastic scattering in the framework of the adiabatic multichannel approach. 19 refs.; 1 fig.; 1 tab.

2295 (JINR-R-2-92-66) **Model of polylinear Bose- and Fetmi-like oscillator.** Yamaleev, R.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 14p. (In Russian). Order Number DE94606303. Source: OSTI; NTIS (US Sales Only); INIS.

The model of polylinear bose- and fermi-like oscillator. Hamiltonian of which has a polylinear dependence of generators, is suggested. The rules of operarion of fermi- and bose-type generators in the discrete Hilbert space of Hamiltonians are defined. It is provied, N-linear oscillator model may be used for the description of the process of creation and annihilation of the N particles which are related to each other similar to particles and antiparticles. The supersymmetric model of polylinear oscillator is built. 16 refs.

2296 (JINR-R-4-92-389) **Classical interpretation of quantum mechanics.** Ignatovich, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 15p. (In Russian). Order Number DE94606304. Source: OSTI; NTIS (US Sales Only); INIS.

The wave-function is considered to be a classical field with the particle as a source. The behavior of particle is determined by the interaction of its field with surrounding objects. An experiment, permitting to estimate the wave composition of a particle field is considered. 10 refs.; 4 figs.

2297 (SLAC-PUB-6010) **On the correspondence limit of relativistic quantum mechanics.** Noyes, H.P. Stanford Linear Accelerator Center, Menlo Park, CA (United States). May 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9306255-1: 1993 symposium on the foundations of modern physics, Cologne (Germany), 1-6 Jun 1993). Order Number DE93040939. Source: OSTI; NTIS; INIS; GPO Dep.

One of the many problems of second quantized relativistic field theory is that the "correspondence limit" either in non- relativistic quantum mechanics for atomic systems or in non- relativistic quantum mechanics for strongly interacting nuclear systems or in classical relativistic particle mechanics is not well specified. In this paper we argue that by using a fully finite and discrete approach to relativistic quantum mechanics we can arrive at a theory which does not have these defects, yet reproduces many of the same empirical results which are conventionally accounted for any elementary particle physics and the related physical cosmology.

6612 Techniques of General Use in Physics

Refer also to citation(s) 507, 1005, 2673, 2689

2298 (ANL/PHY/CP-78785) **Some aspects of linacs as applied to the ISL benchmark facility.** Shepard, K.W. Argonne National Lab., IL (United States). [1992]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9210121-7: Workshop on the production and use of intense radioactive ion beams for the IsoSpin Laboratory, Oak Ridge, TN (United States), 7-10 Oct 1992). Order Number DE93041179. Source: OSTI; NTIS; INIS; GPO Dep.

This paper considers several aspects of using linacs in a radioactive beam facility in terms of the Isospin Laboratory (ISL) Benchmark Facility (BMF) plan, described in the 1991 white paper for a possible radioactive-beam laboratory. The intention is not to review comprehensively the application of linacs to an ISL facility, but to compare in outline form several linac options for such a facility. Particular emphasis is given to the use of superconducting rf technology for the secondary beam accelerator. In what follows, first a possible normally-conducting light-ion linac for a primary beam accelerator is briefly outlined. Then the performance and cost of two options for a secondary beam accelerator are compared: a recent design for a normal-conducting cw linac, and an ATLAS-type superconducting linac. Finally, some of the problems

which may be encountered at the entrance of a secondary beam linac are discussed.

2299 (CONF-9210121–) **Proceedings of the workshop on the production and use of intense radioactive beams at the Isospin Laboratory.** Garrett, J.D. (ed.). Oak Ridge National Lab., TN (United States); Oak Ridge Inst. for Science and Education, TN (United States). [1992]. 442p. Sponsored by USDOE, Washington, DC (United States); Georgia Inst. of Tech., Atlanta, GA (United States); Joint Inst. for Heavy Ion Research, Oak Ridge, TN (United States); Lawrence Berkeley Lab., CA (United States); Los Alamos National Lab., NM (United St DOE Contract AC05-76OR00033 ;AC05-84OR21400. From Workshop on the production and use of intense radioactive ion beams for the IsoSpin Laboratory; Oak Ridge, TN (United States); 7-10 Oct 1992. Order Number DE94000630. Source: OSTI; NTIS; INIS; GPO Dep.

These proceedings report the deliberations of a 3 1/2 day workshop on the Production and Use of Intense Radioactive Ion Beams at the Isospin Laboratory, which was held at the Joint Institute for Heavy Ion Research in Oak Ridge, Tennessee, October 1992. The purpose of this workshop was not to duplicate the programs of other recent radioactive ion beam workshops or international conferences that have focused on the scientific concepts which radioactive beams can, and in fact already are, addressing. Instead, the intent was to address the technical problems associated with the construction of the next generation ISOL facility and to initiate a discussion of the type of experimental equipment that should be developed for such a facility. We have tried to bring together in Oak Ridge the world's experts in radioactive targets/ion sources, light and heavy-ion accelerators, and detection systems. After 1 1/2 days of overview presentations, the participants divided into three discussion groups (Experiments with Radioactive Beams, Target Ion Sources and Mass Separation, and Accelerators-Primary and Secondary) for 1 1/2 days of detailed discussions of the most pertinent issues. The final session was devoted to reports from each of the discussion groups and a general discussion of where to go from here. An outgrowth of these discussions was the establishment of working groups to coordinate future technical developments associated with the pertinent issues. The proceedings include the text of all the overview presentations, reports from each discussion group, as well as contributions from those participants who chose to provide the text of their presentations in the discussion groups and the Concluding Remarks.

2300 (INIS-mf–13714, pp. 205-212) **Plasma characteristics of the Kaufman ion source measured by the Langmuir probe.** Sikola, T. (Vysoke Uceni Technicke, Brno (Czech Republic)); Dittrichova, L.; Dlabaja, R.; Nebojsa, A. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Langmuir probe measurements of the electron and the ion plasma densities, of the electron temperature, and of the wall and plasma potentials in the discharge channel of the Kaufman ion source are reported. The dependence of these basic plasma parameters on the discharge current, on the total pressure and on the extraction voltage, was studied. The reported results may be used for optimization of ion extraction from the discharge plasma. It is shown that by enlarging the anode surface a better stability of the discharge current, and therefore of the ion beam characteristics, may be achieved. (J.U.) 7 figs., 8 refs.

2301 (JINR-R–8-92-238) **Powerful ^{3}He-^{4}He dilution refrigerator for a target with frozen polarization of nuclei.** Borisov, N.S.; Kulikov, V.V.; Neganov, A.B.; Usov, Yu.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 8p. (In Russian). Order Number DE94606322. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Cryogenics.

The design and construction of the powereful ^{3}He-^{4}He dilution refrigerator are described; the minimal temperature in continuous operation was 20 mK. Typical cooling power was about 100 mW at 0.3 K. The refrigerator is primarily intended for cooling large frozen polarized targets. 11 refs.; 3 figs.

2302 (LA-UR–93-2950) **Magnetic insulation of secondary electrons in plasma source ion implantation.** Rej, D.J. (Los Alamos National Lab., NM (United States)); Wood, B.P.; Faehl, R.J.; Fleischmann, H.H. Los Alamos National Lab., NM (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308156–1: Workshop on plasma-based ion implantation, Madison, WI (United States), 4-6 Aug 1993). Order Number DE93040106. Source: OSTI; NTIS; INIS; GPO Dep.

The uncontrolled loss of accelerated secondary electrons in plasma source ion implantation (PSII) can significantly reduce system efficiency and poses a potential x-ray hazard. This loss might be reduced by a magnetic field applied near the workpiece. The concept of magnetically-insulated PSII is proposed, in which secondary electrons are trapped to form a virtual cathode layer near the workpiece surface where the local electric field is essentially eliminated. Subsequent electrons that are emitted can then be reabsorbed by the workpiece. Estimates of anomalous electron transport from microinstabilities are made. Insight into the process is gained with multi-dimensional particle-in-cell simulations.

6613 Other Aspects of Physical Science

Refer also to citation(s) 721, 919, 1370, 1396, 1427, 1443, 1449, 1452, 1517, 1600, 1839, 2297, 2299, 2333, 2875

2303 (ANL/ET/CP–79670) **Theoretical studies of wave propagation in multilayered piezoelectric media.** Chien, Hual-Te; Sheen, Shuh-Haw; Raptis, A.C. Argonne National Lab., IL (United States). Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308167–1: 20. annual review of progress in quantitative nondestructive evaluation (NDE), Brunswick, ME (United States), 1-6 Aug 1993). Order Number DE93040273. Source: OSTI; NTIS; GPO Dep.

The purpose of this paper is to extend the analysis of a single plate or substrate to the case of a multilayered medium. Due to the requiring of higher operating frequency, lower attenuation, and stronger piezoelectricity, layered structure becomes necessary. This technique is rapidly applied in the field of nondestructive evaluation and testing (NDE/T). Recently, a new feature of applying the piezoelectric effect for remote sensing, actuating, and vibration controlling came under study and development in aerospace and automative industries.

2304 (CONF-9209239–8) **Symmetry-dictated trucation: Solutions of the spherical shell model for heavy nuclei.** Guidry, M.W. (Tennessee Univ., Knoxville, TN (United States). Dept. of Physics). Oak Ridge National Lab., TN (United States); Tennessee Univ., Knoxville, TN (United States). Dept. of Physics. [1992]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;FG05-93ER40770. From Workshop on nuclear physics in the universe; Oak Ridge, TN (United States); 24-26 Sep 1992. Order Number DE94000482. Source: OSTI; NTIS; INIS; GPO Dep.

Principles of dynamical symmetry are used to simplify the spherical shell model. The resulting symmetry-dictated truncation leads to dynamical symmetry solutions that are often in quantitative agreement with a variety of observables. Numerical calculations, including terms that break the dynamical symmetries, are shown that correspond to shell model calculations for heavy deformed nuclei. The effective residual interaction is simple, well-behaved, and can be determined from basic observables. With this approach, we intend to apply the shell model in systematic fashion to all nuclei. The implications for nuclear structure far from stability and for nuclear masses and other quantities of interest in astrophysics are discussed.

2305 (INIS-mf–13731, pp. 303) **Anomalous oxygen in the near-earth space in 1985-1989.** Tretyakova, S.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Grigorov, N.L.; Zhuravlyov, D.A.; Kondratyeva, M.A.; Podgurskaya, A.V.; Tretyakova, Ch.A. Academia Sinica, Beijing, BJ (China). Inst. of

Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. OXYGEN/dielectric track detectors; OXYGEN/earth atmosphere; ANGULAR DISTRIBUTION; COSMIC RADIATION; ELECTRIC CHARGES; ENERGY SPECTRA; IONIZATION; OXYGEN; TIME DEPENDENCE

2306 (JINR-D–2-92-159) **Electric potential of ring current-carrying conductor.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 3p. Order Number DE94606324. Source: OSTI; NTIS (US Sales Only); INIS.

It is stressed that the appearance of the electric field around the neutral conductor excitation of current in it doesn't signify the charge of its charge. Thearising electric potential is current dependent, as I^2. 3 refs.

2307 (JINR-D–2-92-196) **On the EKL-effect.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 3p. Order Number DE94606325. Source: OSTI; NTIS (US Sales Only); INIS.

An investigation of the electric field around a neutral conductor after steady conduction current excitation was carried out in the experiments of Edwards et al. The calculations performed on the basis of Lienard - Wiechert's potential and taking into account retardation show that the electric field must not arise in experiments of a similar type. 11 refs.

2308 (JINR-E–2-92-132) **The static and nonstatic electrical solenoids.** Afanas'ev, G.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 24p. Order Number DE94606326. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Phys., A.

We propose the set of charge and current densities which realize static and nonstatic electrical solenoids. Their properties are discussed. The question on the physical meaning of the electromagnetic potentials outside the solenoids and their experimental verification remains to be opened. 19 refs.; 4 figs.

2309 (LA–12601-MS) **Kinetic theory of runaway air breakdown and the implications for lightning initiation.** Roussel-Dupre, R.A. (Los Alamos National Lab., NM (United States)); Gurevich, A.V.; Tunnell, T.; Milikh, G.M. Los Alamos National Lab., NM (United States). Nov 1993. 52p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Contract N0001490K2010. Order Number DE94001683. Source: OSTI; NTIS; INIS; GPO Dep.

The kinetic theory for a new air breakdown mechanism advanced in a previous paper is developed. The relevant form of the Boltzmann equation is derived and the particle orbits in both velocity space and configuration space are computed. A numerical solution of the Boltzmann equation, assuring a spatially uniform electric field, is obtained and the temporal evolution of the electron velocity distribution function is described. The results of our analysis are used to estimate the magnitude of potential x-ray emissions from discharges in thunderstorms and are examined in the context of lightning initiation.

2310 (LA-UR–93-3124) **Nonlocal models in continuum mechanics.** Johnson, N.L. (Los Alamos National Lab., NM (United States)); Phan-Thien, N. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by Department of Defense, Washington, DC (United States); Australian Research Grant Scheme (Australia). DOE Contract W-7405-ENG-36. (CONF-931121–21: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE93040146. Source: OSTI; NTIS; GPO Dep.

The recent appearance of nonlocal methods is examined in the light of traditional continuum mechanics. A comparison of nonlocal approaches in the fields of solid and fluid mechanics reveals that no consistent definition of a nonlocal theory has been used. We suggest a definition based on the violation of the principle of local action in continuum mechanics. From the consideration of the implications of a nonlocal theory based on this definition, we conclude that constitutive relations with nonlocal terms can confuse the traditional separation of the roles between conservation laws and constitutive relations. The diversity of motivations for the nonlocal approaches are presented, resulting primarily from deficiencies in numerical solutions to practical problems. To illustrate these concepts, the history of nonlocal terms in the field of viscoelastic fluids is reviewed. A specific example of a viscoelastic constitutive relation that contains a stress diffusion term is applied to a simple shear flow and found not to be a physical description of any known fluid. We conclude by listing questions that should be asked of nonlocal approaches.

2311 (LA-UR–93-3390) **Design and analysis of high-field quasi-continuous magnets.** Boenig, H.J. (Los Alamos National Lab., NM (United States)); Campbell, L.J.; Rickel, D.G.; Rogers, J.D.; Schillig, J.B.; Sims, J.R.; Pernambuco-Wise, P.; Schneider-Muntau, H.J.; Van Bockstal, L. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant DMR-9016241. (CONF-930926–2: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94000762. Source: OSTI; NTIS; GPO Dep.

Pulsed magnets of 60 tesla or more with a flat-top of 100 ms (quasi-continuous) are among the user facilities to be provided by the NHMFL. The design of such magnets is constrained by available materials and thermal recycle time. The design path discussed here tailors materials and current densities or independent concentric coils. The progressive design steps are illustrated by a specific example of an eight-coil, 60T magnet. In the preliminary design stage closed form calculations of magnetic, structural, thermal, and electrical circuit behavior are used to achieve a practical design that meets Initial requirements. Design refinement incorporates finite element analyses and test results on materials, fabrication and prototypes. Higher fields are possible without large changes.

2312 (LA-UR–93-3488) **Recent results from the Soviet-American Gallium Experiment.** Anosov, O.L. (Russian Academy of Sciences, Moscow (Russian Federation). Inst. for Nuclear Research); Gavrin, V.N.; Faizov, E.L. Los Alamos National Lab., NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States); AN SSSR, Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij; Ministry of Sciences (Russian Federation); National Science Foundation, Washington, DC (United St DOE Contract W-7405-ENG-36. (CONF-930637–5: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94000677. Source: OSTI; NTIS; INIS; GPO Dep.

A radiochemical $^{71}Ga-^{71}Ge$ experiment to determine the primary flux of neutrinos from the Sun began measurements of the solar neutrino flux at the Baksan Neutrino Observatory in 1990. The number of ^{71}Ge atoms extracted from 30 tons of gallium in 1990 and from 57 tons of gallium in 1991 was measured in twelve runs during the period of January 1990 to December 1991. The combined 1990 and 1991 data sets give a value of $58 + 17/-24$ (stat) $\pm$ 14 (syst) SNU. This is to be compared with 132 SNU predicted by the Standard Solar Model.

2313 (LBL–34575) **Restoring locality with faster-than-light velocities.** Eberhard, P.H. Lawrence Berkeley Lab., CA (United States). 30 Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9209407–1: Waves and particles in light and matter conference, Trani (Italy), 24-30 Sep 1992). Order Number DE93040926. Source: OSTI; NTIS; INIS; GPO Dep.

The idea of "locality" is a deep rooted concept. It does not have to be abandoned even if "loophole free" EPR experiments are performed and confirm the predictions of quantum theory. To satisfy locality, one can imagine that influences at a distance are exerted via mechanisms involving an ether and effects propagating in that ether a velocity $V > c$. Such model of physical phenomena is not Lorentz invariant but, with V large enough, the model can be made to reproduce the results of all experiments where quantum mechanics and Lorentz invariance have been verified.

2314 (PPPL–2935) **Theory of ballooning-mirror instabilities for anisotropic pressure plasmas in the magnetosphere.** Cheng, C.Z.; Qian, Q. Princeton Univ., NJ (United States). Plasma Physics Lab. Sep 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94001719. Source: OSTI; NTIS; INIS; GPO Dep.

This paper deals with a kinetic-MHD eigenmode stability analysis of low frequency ballooning-mirror instabilities for anisotropic pressure plasmas in the magnetosphere. The ballooning mode is a dominant transverse wave driven unstable by pressure gradient in the bad curvature region. The mirror mode with a dominant compressional magnetic field perturbation is excited when the product of plasma beta and pressure anisotropy is large. The field-aligned eigenmode equations take into account the coupling of the transverse and compressional components of the perturbed magnetic field and describe the coupled ballooning-mirror mode. Because the energetic trapped ions precess very rapidly across the $\vec{B}$ field, their motion becomes very rigid with respect to low frequency MHD perturbations with symmetric structure of parallel perturbed magnetic field $\delta B_{\parallel}$ and electrostatic potential Φ along the north-south ambient magnetic field, and the symmetric ballooning-mirror mode is shown to be stable. On the other hand, the ballooning-mirror mode with antisymmetric $\delta B_{\parallel}$, and Φ structure along the north-south ambient magnetic field is only weakly influenced by energetic trapped particle kinetic effects due to rapid trapped particle bounce motion and has the lowest instability threshold determined by MHD theory. With large plasma beta ($\beta_{\parallel} \geq O(1)$) and pressure anisotropy ($P_{\perp}/P_{\parallel} > 1$) at equator the antisymmetric ballooning-mirror mode structures resemble the field-aligned wave structures of the multisatellite observations of a long lasting compressional Pc 5 wave event during November 14–15, 1979 [Takahashi et al.]. The study provides the theoretical basis for identifying the internal excitation mechanism of ULF (Pc 4-5) waves by comparing the plasma stability parameters computed from the satellite particle data with the theoretical values.

2315 (SAND–93-1351) **Projectile transverse motion and stability in electromagnetic induction launchers.** Shokair, I.R. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001557. Source: OSTI; NTIS; GPO Dep.

The transverse motion of a projectile in an electromagnetic induction launcher is considered. The equations of motion for translation and rotation are derived assuming a rigid projectile and a flyway restoring force per unit length that is proportional to the local displacement. Transverse forces and torques due to energized coils are derived for displaced or tilted projectile elements based on a first order perturbation method. The resulting equations of motion for a rigid projectile composed of multiple elements in a multi-coil launcher are analyzed as a coupled oscillator system of equations and a simple stability condition is derived. The equations of motion are incorporated into the 2-D Slingshot code and numerical solutions for the transverse motion are obtained. For the 20 meter navy launcher parameters we find that stability is achieved with a flyway spring constant of $k \approx 1 \times 10^8$ N/m^2. For $k \approx 1.5 \times 10^8$ N/m^2 and sample coil misalignment modeled as a sine wave of I mm amplitude at wavelengths of one or two meters, the projectile displacement grows to a maximum of 4 mm. This growth is due to resonance between the natural frequency of the Projectile transverse motion and the coil displacement wavelength. This resonance does not persist because of the changing axial velocity. Random coil displacement is also found to cause roughly the same projectile displacement. For the maximum displacement a rough estimate of the transverse pressure is 50 bars.

2316 (UCRL-CR–115021) **An improved analytic solution for analysis of particle trajectories in fibrous, two-dimensional filters.** Marshall, H. (Michigan Univ., Ann Arbor, MI (United States)); Sahraoui, M.; Kaviany, M. Lawrence Livermore National Lab., CA (United States); Michigan Univ., Ann Arbor, MI (United States). Aug 1993. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93041115. Source: OSTI; NTIS; GPO Dep.

The Kuwabara solution for creeping fluid flow through periodic arrangement of cylinders is widely used in analytic and numerical studies of fibrous filters. Numerical solutions have shown that the Kuwabara solution has systematic errors and when used for the particle trajectories in filters it results in some error in the predicted filter efficiency. The numerical solutions although accurate, preclude further analytic treatments and are not as compact and convenient to use as the Kuwabara solution. By re-examining the outer boundary conditions of the Kuwabara solution, we have derived a correction term to the Kuwabara solution to obtain an extended solution that is more accurate and improves prediction of the filter efficiency. By comparison with the numerical solutions, it is shown that the Kuwabara solution is the high porosity asymptote and that the extended solution has an improved porosity dependence. We explain a rectification which can make particle collection less efficient for periodic, in-line arrangements of fibers with particle diffusion or body force. This rectification also results in the alignment of particles with inertia (i.e., high Stokes number particles).

2317 (UCRL-ID–112771) **Computational Electronics and Electromagnetics.** DeFord, J.F. Lawrence Livermore National Lab., CA (United States). Mar 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94003014. Source: OSTI; NTIS; GPO Dep.

The Computational Electronics and Electromagnetics thrust area is a focal point for computer modeling activities in electronics and electromagnetics in the Electronics Engineering Department of Lawrence Livermore National Laboratory (LLNL). Traditionally, they have focused their efforts in technical areas of importance to existing and developing LLNL programs, and this continues to form the basis for much of their research. A relatively new and increasingly important emphasis for the thrust area is the formation of partnerships with industry and the application of their simulation technology and expertise to the solution of problems faced by industry. The activities of the thrust area fall into three broad categories: (1) the development of theoretical and computational models of electronic and electromagnetic phenomena, (2) the development of useful and robust software tools based on these models, and (3) the application of these tools to programmatic and industrial problems. In FY-92, they worked on projects in all of the areas outlined above. The object of their work on numerical electromagnetic algorithms continues to be the improvement of time-domain algorithms for electromagnetic simulation on unstructured conforming grids. The thrust area is also investigating various technologies for conforming-grid mesh generation to simplify the application of their advanced field solvers to design problems involving complicated geometries. They are developing a major code suite based on the three-dimensional (3-D), conforming-grid, time-domain code DSI3D. They continue to maintain and distribute the 3-D, finite-difference time-domain (FDTD) code TSAR, which is installed at several dozen university, government, and industry sites.

2318 (UCRL-ID–114915) **Search for pseudoscalar cold dark matter.** van Bibber, K.; Stoeffl, W. LLNL Collaborators. Lawrence Livermore National Lab., CA (United States). 29 May 1992. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93019879. Source: OSTI; NTIS; GPO Dep.

AH dynamical evidence points to the conclusion that the predominant form of matter in the universe is in a non-luminous form. Furthermore, large scale deviations from uniform Hubble flow, and the recent COBE reports of inhomogeneities in the cosmic microwave background strongly suggest that we live in an exactly closed universe. If this is true, then ordinary baryonic matter could only be a minority component (10% at most) of the missing mass, and that what constitutes the majority of the dark matter must involve new physics. The axion is one of very few well motivated candidates which may comprise the dark matter. Additionally it is a 'cold' dark-matter candidate which is preferred by the COBE data. We propose to construct and operate an experiment to search for axions which may constitute the dark matter of our own galaxy. As proposed by Sikivie, dark-matter axions may be detected by their stimulated conversion into monochromatic microwave photons in a tunable high-Q cavity inside a strong magnetic field. Our ability to mount an experiment quickly and take data within one year is due

to a confluence of three factors. The first is the availability of a compact high field superconducting magnet and a local industrial partner, Wang NMR, who can make a very thermally efficient and economical cryostat for it. The second is an ongoing joint venture with the Institute for Nuclear Research of the Russian Academy of Sciences to do R&D on metalized precision-formed ceramic microwave cavities for the axion search, and INR has commited to providing all the microwave cavity arrays for this experiment, should this proposal be approved. The third is a commitment of very substantial startup capital monies from MIT for all of the state-of-the-art ultra-low noise microwave electronics, to one of our outstanding young collaborators who is joining their faculty.

2319 (UCRL-JC–112349) **Opacity measurements in shock-generated argon plasmas.** Erskine, D. Lawrence Livermore National Lab., CA (United States). Jul 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930676–56: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE94001057. Source: OSTI; NTIS; GPO Dep.

Dense plasmas having uniform and constant density and temperature are generated by passage of a planar shock wave through gas. The opacity of the plasma is accurately measured versus wavelength by recording the risetime of emitted light. This technique is applicable to a wide variety of species and plasma conditions. Initial experiments in argon have produced plasmas with 2 eV temperatures, 0.004–0.04 g/cm^3 densities, and coupling parameters Γ ~0.3–0.7. Measurements in visible light are compared with calculations using the HOPE code. An interesting peak in the capacity at 400 nm is observed for the first time and is identified with the 4s-5p transition in excited neutral argon atoms.

2320 (UCRL-JC–113294) **Quantum and quasi-classical analyses of high order emission processes.** Schafer, K.J.; Kulander, K.C. Lawrence Livermore National Lab., CA (United States). Jun 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303119–5: 5. short wavelength: physics with intense laser pulses, San Diego, CA (United States), 29-31 Mar 1993). Order Number DE93041348. Source: OSTI; NTIS; GPO Dep.

High-order harmonic generation from atoms and ions cuts off in accord with the simple rule: $E_c \sim I_p + 3U_p$. This cutoff rule as well as the lack of a cutoff in high- order electron energy spectra can be understood via a simple extension of existing two step quasi-classical models.

2321 (UCRL-JC–113895) **Microscopic and macroscopic dynamics.** Hoover, W.G. (California Univ., Davis, CA (United States). Dept. of Applied Science); Hoover, C.G.; De Groot, A.J.; Pierce, T.G. Lawrence Livermore National Lab., CA (United States). Jun 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310161–1: 2. international Austrian conference on parallel computing (ACPC), Vienna (Austria), 4-8 Oct 1993). Order Number DE93019576. Source: OSTI; NTIS; GPO Dep.

Atomistic Molecular Dynamics and Lagrangian Continuum Mechanics can be very similarly adapted to massively-parallel computers. Millions of degrees of freedom can be treated. The two complementary approaches, microscopic and macroscopic, are being applied to increasingly realistic flows of fluids and solids. The two approaches can also be combined in a hybrid simulation scheme. Hybrids combine the fundamental constitutive advantage of atoms with the size advantage of the continuum picture.

2322 (UCRL-JC–114095) **Radio galaxies and their environment.** van Breugel, W. Lawrence Livermore National Lab., CA (United States). 24 Feb 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9109510–1: Jets in extragalactic radio sources, Rinberg Castle (Germany), 22-28 Sep 1991). Order Number DE93040851. Source: OSTI; NTIS; INIS; GPO Dep.

The relationships between radio galaxies and their environment are varied, complex, and evolve with cosmic epoch. Basic questions are what role the environment plays in triggering and fuelling (radio) galaxy activity what the effects of this activity are on its environment, and how radio galaxies and environment evolve. Clearly, this could be the topic of a workshop all in itself and the scope of this review will necessarily be limited. A review of the connections between environment and galaxy activity in general has been given by Heckman. First, I will briefly summarize the relationships between parent galaxy and cluster environments, and radio galaxies. A more detailed discussion of various aspects of this will be given elsewhere by F. Owen, J.0. Burns and R. Perley. I will then discuss the current status of investigations of extended emission-line regions in radio galaxies, again referring elsewhere in this volume for more detailed discussions of some particular aspects (kinematics and ionization mechanisms by K. Meisenheimer; polarization and spectral index lobe asymmetries by G. Pooley). I will conclude with a brief discussion of the current status of observations of high redshift radio galaxies.

2323 (UCRL-JC–114311) **Smoothed-particle hydrodynamics and nonequilibrium molecular dynamics.** Hoover, W.G. (California Univ., Davis, CA (United States)); Hoover, C.G. Lawrence Livermore National Lab., CA (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States); Academy of Applied Science, NH (United States). DOE Contract W-7405-ENG-36. (CONF-931121–25: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94001059. Source: OSTI; NTIS; GPO Dep.

Gingold, Lucy, and Monaghan invented a grid-free version of continuum mechanics "smoothed-particle hydrodynamics," in 1977. It is a likely contributor to "hybrid" simulations combining atomistic and continuum simulations. We describe applications of this particle-based continuum technique from the closely-related standpoint of nonequilibrium molecular dynamics. We compare chaotic Lyapunov spectra for atomistic solids and fluids with those which characterize a two-dimensional smoothed-particle fluid system.

2324 (UCRL-JC–114363) **A geometric weighted elliptic grid regeneration method for 3D unstructured ALE hydrodynamics.** Dube, E.; Rodrigue, G. Lawrence Livermore National Lab., CA (United States). 20 Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308172–1: 5. international symposium on computational fluid dynamics, Sendai (Japan), 31 Aug - 3 sep 1993). Order Number DE94000309. Source: OSTI; NTIS; GPO Dep.

The theory for an elliptic mesh generator is developed for use in the advection step of a 3D ALE algorithm. This mesh generator is derived by a variational principle for an unstrutured 3D grid using finite elements. An arbitrary weight function is introduced which is based on the geometric properties of the existing mesh. These geometric weights should allow for a smooth grid that retains the general shape of the original mesh.

2325 (UCRL-JC–114934) **Sound velocity estimation: A system theoretic approach.** Candy, J.V. (Lawrence Livermore National Lab., CA (United States)); Sullivan, E.J. Lawrence Livermore National Lab., CA (United States). 30 Jul 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310159–1: OCEANS 93: engineering in harmony with the ocean, Victoria (Canada), 18-21 Oct 1993). Order Number DE93019606. Source: OSTI; NTIS; GPO Dep.

A system-theoretic approach is proposed to investigate the feasibility of reconstructing a sound velocity profile (SVP) from acoustical hydrophone measurements. This problem is based on a state-space representation of the normal-mode propagation model. It is shown that this representation can be utilized to investigate the so-called observability of the SVP from noisy measurement data. A model-based processor is developed to extract this information and it is shown that even in cases where limited SVP information is available, the SVP can be estimated using this approach.

2326 (UCRL-JC–115418) **Fully coupled nonlinear thermo-mechanical analysis including general contact in PALM2D.** Engelmann, B.E.; Whirley, R.G. Lawrence Livermore National Lab., CA (United States). 7 Oct 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931121–27: Annual winter meeting of the American Society

of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94001661. Source: OSTI; NTIS; GPO Dep.

Fully coupled thermomechanical analysis solves the thermal problem on the deforming geometry and incorporates thermal loads into the mechanical problem. In contrast, traditional thermal stress analysis is based on an uncoupled approach in which the thermal problem is solved on a fixed geometry, and the resulting temperatures are then used to load a mechanical problem. Thermal contact, in which heat flow paths depend on the mechanical deformations of adjacent surfaces, is a major component of many fully coupled thermomechanical analyses. This paper presents the development of a thermomechanical finite element formulation, including contact. The proposed approach accommodates arbitrarily large relative motions of contact surfaces, fully unstructured meshes, pressure-dependent contact resistance, conduction across small gaps, and approximate models for convection and radiation. The theory described herein has been implemented in the Lawrence Livermore National Laboratory public code PALM2D and has been used to solve a diverse set of thermomechanical problems. Examples illustrating the performance of this code on large deformation thermomechanical problems are presented and discussed.

2327 (WSRC-TR-93-430) **Gamma ray spectrometry of LDEF samples: Results of 1992 analyses.** Winn, W.G. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94001177. Source: OSTI; NTIS; GPO Dep.

In January 1990, NASA retrieved the Long Duration Exposure Facility (LDEF), which had orbited the Earth since April 1984. The satellite had become slightly radioactive due to cosmic exposure, and the SRTC Underground Counting Facility was used to analyze LDEF samples of Al and Ta for activations of ^{22}Na, ^{172}Lu, and ^{173}Lu. Background steel trunnion samples, not irradiated in space, were analyzed for ^{60}Co. This report summarizes results for 15 samples analyzed in 1992.

6620 Physics of Elementary Particles and Fields

2328 (INIS-mf-13731, pp. 73) **Scanning tunneling microscopy study of heavy ion tracks.** Zhai Peingji (Academia Sinica, Beijing, BJ (China). Inst. of High Energy Physics); Tang Xiaowei. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413--: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts*. Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY IONS/radiation effects; SCANNING ELECTRON MICROSCOPY/particle tracks; SULFIDES; SURFACES; TUNNEL EFFECT

2329 (INIS-SU-321/A) **Elementary particles. Issue 2.** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki. 1989. 214p. (In Russian). Order Number DE93609886. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2330 (LA-UR-93-3271) **Changes in science: An example.** Slansky, R. Los Alamos National Lab., NM (United States). 9 Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309244-1: 13. Fermilab industrial affiliates meeting and industry briefing, Chicago, IL (United States), 9 Sep 1993). Order Number DE94000776. Source: OSTI; NTIS; GPO Dep.

This report discusses the frontiers of science in today world.

6621 General Theory of Particles and Fields

Refer also to citation(s) 2297, 2383, 2406, 2414

2331 (ANL-HEP-CP-93-70) **The Pomeron and QCD with many light quarks.** White, A.R. Argonne National Lab., IL (United States). 26 Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9306221--8: 19 international conference on elastic and diffractive scattering (5th Blois workshop), Providence, RI (United States), 8-12 Jun 1993). Order Number DE94001351. Source: OSTI; NTIS; INIS; GPO Dep.

An outline is given of the physics relating the Pomeron phase transition to the anomaly in QCD with many massless quarks. Implications for the existence of a further quark sector and its relation to dynamical electroweak symmetry breaking are described.

2332 (ANL-HEP-CP-93-77) **CP violation outside the standard model phenomenology for pedestrians.** Lipkin, H.J. (Weizmann Inst. of Science, Rehovot (Israel). Dept. of Nuclear Physics). Argonne National Lab., IL (United States). 23 Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9306258--4: Workshop on B physics at hadron colliders, Snowmass, CO (United States), Jun 1993). Order Number DE94002216. Source: OSTI; NTIS; INIS; GPO Dep.

So far the only experimental evidence for CP violation is the 1964 discovery of $K_L \rightarrow 2\pi$ where the two mass eigenstates produced by neutral meson mixing both decay into the same CP eigenstate. This result is described by two parameters ϵ and ϵ'. Today $\epsilon \approx$ its 1964 value, ϵ' data are still inconclusive and there is no new evidence for CP violation. One might expect to observe similar phenomena in other systems and also direct CP violation as charge asymmetries between decays of charge conjugate hadrons $H^{+-} \rightarrow f^{+-}$. Why is it so hard to find CP violation? How can B physics help? Does CP lead beyond the standard model? The author presents a pedestrian symmetry approach which exhibits the difficulties and future possibilities of these two types of CP-violation experiments, neutral meson mixing and direct charge asymmetry: what may work, what doesn't work and why.

2333 (FNAL/C-93/196-A) **The current status of observational constraints on cosmic strings.** Caldwell, R.R. Fermi National Accelerator Lab., Batavia, IL (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC02-76CH03000. Grant NAGW-2381. (CONF-9305199--2: Gravity and relativistic astrophysics, Waterloo (Canada), 13-15 May 1993). Order Number DE94001505. Source: OSTI; NTIS; GPO Dep.

The observational restrictions on the cosmic string scenario for the formation of large scale structure are evaluated. this restrictions are due to the spectrum of gravitational radiation emitted by oscillating string loops, anisotropies in the cosmic microwave background caused by the strings, and evaporating black holes formed from collapsed cosmic string loops. It is shown that the only free parameter of the scenario, the cosmic string mass-per-unit-length, μ, is severely restricted.

2334 (FNAL/C-93/213-E) **SUSY search using trilepton events from $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV.** CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 15p. Sponsored by USDOE, Washington, DC (United States). (CONF-930823-13: Symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94000591. Source: OSTI; NTIS; INIS; GPO Dep.

In a preliminary analysis, we have looked for evidence of the production and decay of SUSY chargino-neutralino (often referred to as Wino-Zino) pairs into the trilepton events using 11.1 pb^{-1} of $p\bar{p}$ collision data at $\sqrt{s}$ = 1.8 TeV collected in 1992–1993 by CDF. Using all possible electron and muon decay channels, we observe two events which pass our trilepton criteria. Assuming, for the purposes of a conservative limit, that these events are all signal events, we exclude a point in the parameter space of the Minimal Supersymmetric Standard Model (MSSM) which corresponds to the limit of sensitivity of LEP measurements. Systematic errors have not been included in the result. Larger data samples and a more careful treatment should allow a large region of MSSM parameter space to be explored using the trilepton channel.

2335 (INP-MSU-92-17-266) **Wilson loop for SU(N)-gluodynamics.** Timoshenko, E.G. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij

Inst. Yadernoj Fiziki. 1992. 13p. (NIIYaF-MGU–92-17-266.). Order Number DE94606337. Source: OSTI; NTIS (US Sales Only); INIS.

Wilson loop of SU(N) gluodynamics in 3-d Fock-Schwinger gauge is shown to obey the area law at confined phase. The general expression of the string tension is obtained. 19 refs.

2336 (JINR-D–2-92-63) **Three forms of relativity.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 6p. Order Number DE94606338. Source: OSTI; NTIS (US Sales Only); INIS.

The physical sense of three forms of the relativity is discussed. The first - instant from - respects in fact the traditional approach based on the concept of instant distance. The normal form corresponds the radar formulation which is based on the light or retarded distances. The front form in the special case is characterized by 'observable' variables, and the known method of k-coefficient is its obvious expression. 16 refs.

2337 (JINR-D–2-92-70) **On a direct experimental verification of the 'elongation formula'.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 3p. Order Number DE94606329. Source: OSTI; NTIS (US Sales Only); INIS.

It is noted that experiments on studying the transverse Doppler effect are the direct evidence in favour of the 'elongation formula' following from the concept of the relativistic length. This concept is the base of the radar formulation of the relativity. 7 refs.

2338 (JINR-D–2-92-114) **Apparent unambiguousness of relativistic time dilation.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 4p. Order Number DE94606328. Source: OSTI; NTIS (US Sales Only); INIS.

It is indicated on the definite analogy between the dependence of visible sizes of relativistic objects and period of the wave, emitted by the moving source from the observation conditions ('retradition factor'). It is noted that the definition of time for moving extended objects, led to relativistic dilation, corresponds to the definition of the relativistic (radar) length led to the 'elongation formula'. 10 refs.

2339 (JINR-E–2-92-337) **Twistor-like type II superstring and bosonic string.** Chikalov, V.V. (Sumskij Inst. Prikladnoj Fiziki, Sumy (Ukraine)); Pashnev, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 11p. Order Number DE94606339. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Mod. Phys. Lett. A.

The superfield formulation of type II Green-Schwarz superstring with n=(1,0) world-sheet supersymmetry is constructed. It is shown that the inclusion of the second spinor coordinate in the target superspace leads to the possibility of the reparametrization invariant description of the superstring in the absence of any field from the two-dimensional supergravity multiplet. The twistor-like action of chern-simons type for bosonic string in D=3, 4, 6, 10 is deduced from the superstring action. 16 refs.

2340 (JINR-E–2-92-377) **The Klein-Fock equation, minimal surfaces and gravitational fields.** Fedorov, F.I. (AN Belorusskoj SSR, Minsk (Belarus). Inst. Fiziki); Shavokhina, N.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 12p. Order Number DE94606340. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Quantum Nonlinear Phenomena.

A nonlinear scalar field of the Born-Infeld type is considered whose linear analog is the scalar field obeying the Klein-Fock equation. It is shown that if the initial scalar field is massless, a nonlinear field of the Born-Infeld type corresponding to it is described by the equations of minimal surfaces in pseudo-Euclidean spaces with the coordinates ct, x, bϕ. The coordinate ϕ may be have been both space-like and time-like nature. If the initial field is massive, the corresponding field of the Born-Infeld type is described by the equations of minimal surfaces in curved spaces with the same coordinates ct, x, bϕ. We can say that massive fields of the Born-Infeld type are extended sources of the gravitational fields. 17 refs.

2341 (JINR-E–2-92-411) **Even and odd symplectic and Kaehlerian structures on projective superspaces.** Khudaverdyan, O.M. (Erevanskij Gosudarstvennyj Univ., Erevan (Armenia)); Nersessyan, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 23p. Order Number DE94606383. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Math. Phys.

Supergeneralization of CP(N) provided by even and odd Kaehlerian structures from Hamiltonian reduction are construct. Operator Δ which used in Batalin - Vilkovsky quantization formalism and mechanics which are bi-Hamiltonian under corresponding even and odd Poisson brackets are considered. 21 refs.

2342 (JINR-E–2-92-479) **On the model of the relativistic particle with curvature and torsion.** Nesterenko, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 10p. Order Number DE94606330. Source: OSTI; NTIS (US Sales Only); INIS.

Two integrals along the world trajectory of its curvature and torsion are added to the standard action for the point-like spinless relativistic particle. This enables one to quantize the model canonically and to derive exactly the relation between the spin and mass of the states. 10 refs.

2343 (JINR-E–2-92-497) **Solution of the Heisenberg equation for the four-fermion contact interaction by the method of dynamical mappings.** Vall, A.N. (Irkutskij Gosudarstvennyj Univ., Irkutsk (Russian Federation)); Leviant, V.M.; Sinitskaya, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 22p. Order Number DE94606341. Source: OSTI; NTIS (US Sales Only); INIS.

In the paper non-relativistic analog of the Nambu- Jona -Lasinio model and demonstrate, by this most simplified example, the method of dynamical mappings of Heisenberg fields on physical fields is considered. The expressions for one particle eigen-excitation spectrum of full Hamiltonian (spectrum of clad fermions), wave function of two excitations bound state and its mass, and compute the Bethe-Solpither amplitude are obtained. The relation for the density of vacuum energy is derived as well as a function of mapping parameters. The minimization of energy leads us to the fixation of these parameters. The method admits the generalization of the relativistic case. 11 refs.

2344 (JINR-E–5-92-395) **On invariant measures for some infinite-dimensional dynamical systems.** Zhidkov, P.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 14p. Order Number DE94606342. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nonlinearity.

An abstract infinite-dimensional Hamiltonian system recently introduced by M.Grillakis, J.Shatah and W.A.Strauss is considered. A lot of nonlinear evolution equations of the mathematical physics may be represented in that form. The aim of the paper is the construction of an invariant measure for this system. This measure has many applications in the theory of dynamical systems. In particular, the conditions for the finiteness of the constructed measure are presented. It makes possible to apply the Poincare recurrence theorem which explains the well-known Fermi-Past-Ulam phenomenon of the return of any solution to its initial data with time with an arbitrary accuracy. 20 refs.

2345 (JINR-E–17-92-412) **Path integral for coherent states of the dynamical U_2 group and $U_{2/1}$ supergroup.** Kochetov, E.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 14p. Order Number DE94606382. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Phys., A Gen. Phys.

A part-integral formulation in the representation of coherent states for the unitary U_2 group and $U_{2/1}$ supergroup is introduced. U_2 and $U_{2/1}$ path integrals are shown to be defined on the coset spaces U_2/U_1xU_1 and $U_{2/1}/U_{1/1}xU_1$, respectively. These coset appears as curved classical phase spaces. Partition functions are expressed as path integrals over these spaces. In the case when U_2 and $U_{2/1}$ are the dynamical groups, the corresponding path

integrals are evaluated with the help of linear fractional transformations that appear as the group (supergroup) action in the coset space (superspace). Possible applications for quantum models are discussed. 9 refs.

2346 (JINR-R–11-92-142) **The solving of the relativistic two-body problem with a nonlinear dependence upon a spectrum parameter.** Zhidkov, E.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Skachkov, N.B.; Khoromskij, B.N.; Gregus, M.M.; Makarenko, T.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 7p. (In Russian). Order Number DE94606343. Source: OSTI; NTIS (US Sales Only); INIS.

An approach to the numerical investigation of the quasipotential integral equation describing the coupled two-particle system in momentum space is proposed for the case when the integral operator contain the nonlinear dependence on the eigenvalue μ, connected with total mass of system M by the correlation μ=M/m. The results of numerical calculations for some potentials are given. 11 refs.; 4 tabs.

2347 (LA-UR–93-3496) **Nonlinearity with disorder: Spatiotemporal complex behavior arising from length scales competition.** Sanchez, A.; Bishop, A.R. Los Alamos National Lab., NM (United States). 20 Sep 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309185–3: Fluctuations and order: the new synthesis workshop, Los Alamos, NM (United States), 9-12 Sep 1993). Order Number DE94000675. Source: OSTI; NTIS; GPO Dep.

One of the many mechanisms underlying complex behavior in physical systems is competition between different length or time scales, which may arise naturally in the considered system or may be imposed by external influences. The purpose of this paper is the following. By means of three examples the authors will illustrate how identification of relevant length scales can lead to a separation of the system behavior in two regimes. Far from the competition region, it can be described in very simple ways, usually involving a few degrees of freedom. On the contrary, when relevant scales are in conflict, the behavior of the system turns out to be complex, typically chaotic. Therefore, the success of this approach is that it goes straightforwardly to the deep reasons for complex behavior, making amenable to analytical studies all other regimes.

2348 (LA-UR–93-3516) **Likelihood analysis of parity violation in the compound nucleus.** Bowman, D. (Los Alamos National Lab., NM (United States)); Sharapov, E. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9305235–4: International workshop/time reversal invariance and parity violation in neutron physics, Dubna (Russian Federation), 4-7 May 1993). Order Number DE94000671. Source: OSTI; NTIS; INIS; GPO Dep.

We discuss the determination of the root mean-squared matrix element of the parity-violating interaction between compound-nuclear states using likelihood analysis. We briefly review the relevant features of the statistical model of the compound nucleus and the formalism of likelihood analysis. We then discuss the application of likelihood analysis to data on panty-violating longitudinal asymmetries. The reliability of the extracted value of the matrix element and errors assigned to the matrix element is stressed. We treat the situations where the spins of the p-wave resonances are not known and known using experimental data and Monte Carlo techniques. We conclude that likelihood analysis provides a reliable way to determine M and its confidence interval. We briefly discuss some problems associated with the normalization of the likelihood function.

2349 (OUP–93-13) **A rotating string.** Jensen, B. Oslo Univ. (Norway). Fysisk Inst. Jun 1993. 9p. Order Number DE94606344. Source: OSTI; NTIS; INIS.

The author presents a global solution of Einstein's equations which represents a rotating cosmic string with a finite coreradius. The importance of pressure for the generation of closed timelike curves outside the coreregion of such strings is clearly displayed in this model due to the simplicity of the source. 10 refs.

2350 (RAL–93-025, pp. 1-59) **Quantum field theory: canonical and path integral approaches.** Halliday, I.G. (University of Wales, Swansea (United Kingdom)). Rutherford Appleton Lab., Chilton (United Kingdom). Apr 1993. (CONF-9209388–: School for young high energy physicists, Abingdon (United Kingdom), 6 Sep 1992). In *Proceedings of the school for young high energy physicists.* 250p. Order Number DE94602554. Source: OSTI; NTIS (US Sales Only); INIS.

This lecture, given at the 1992 School for Graduate High Energy Physicists held in Abingdon, United Kingdom, considers canonical and path integral approaches to quantum field theory. The author aims to put together undergraduate courses on quantum mechanics and electromagnetism and to demonstrate how to quantise an arbitrary theory. A proof of Feynman rules for the perturbative evaluation of field theories, such as scalar fields, Yang-Mills and the Higgs effect, is given. The author highlights how one method can assist the understanding of a second idea, while masking a third. Thus Hamiltonian methods make Quantum Mechanics straightforward, but hide symmetries. (UK).

2351 (UNIT-F–1992-8) **Limits on supersymmetry masses from the anomalous magnetic moment of leptons.** Syljuaasen, O.F.; Olsen, H.A. Trondheim Univ. (Norway). Inst. for Fysikk. Apr 1992. 10p. Order Number DE94606332. Source: OSTI; NTIS; INIS.

Lower limits on slepton and photino masses $m_{\tilde{3}}$ and $m_{\tilde{p}}$ are obtained from the experimental values of the anomalous magnetic moments of the electron and muon. Typical values are $m^{e}_{\tilde{s}} > 1.5$ GeV,$m^{\mu}_{\tilde{s}} > 15$ GeV for $m_{\tilde{p}} << m_{\tilde{s}}$ and $m_{\tilde{p}} > 22$ GeV for $m_{\mu\tilde{s}} << m_{\tilde{p}}$. The present large experimental uncertainty in the τ anomalous magnetic moment prevents any statement about the mass of the τ slepton. 8 refs., 2 figs.

2352 (YITP/U–93-15) **Long-distance properties of frozen U(1) Higgs and axially U(1)-gauged four-Fermi models in 1 + 1 dimensions.** Yamamoto, Hisashi. Kyoto Univ., Uji (Japan). Yukawa Inst. for Theoretical Physics. Jul 1993. 52p. Order Number DE94719015. Source: OSTI; NTIS; INIS.

We study the long-distance relevance of vortices (instantons) in an N-component axially U(1)-gauged four-Fermi theory in 1 + 1 dimensions, in which a naive use of 1/N expansion predicts the dynamical Higgs phenomenon. Its general effective lagrangian is found to be a frozen U(1) Higgs model with the gauge-field mass term proportional to an anomaly parameter (b). The dual-transformed versions of the effective theory are represented by sine-Gordon systems and recursion-relation analyses are performed. The results suggest that in the gauge-invariant scheme (b = 0) vortices are always relevant at long distances, while in non-invariant schemes (b > 0) there exists a critical N above which the long-distance behavior is dominated by a free massless scalar field. (author).

6622 Specific Theories and Interaction Models; Particle Systematics

Refer also to citation(s) 2331, 2351, 2371, 2376, 2385, 2399, 2400, 2402, 2406

2353 (ANL-HEP-CP–93-60) **Summary of the extensions of the Standard Model working group.** Godfrey, S. (Carleton Univ., Ottawa, Ontario (Canada). Dept. of Physics); Rizzo, T.G. Argonne National Lab., IL (United States); Carleton Univ., Ottawa, ON (Canada). Dept. of Physics. Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States); Natural Sciences and Engineering Research Council of Canada, Ottawa, ON (Canada). DOE Contract W-31109-ENG-38. (CONF-9306176–11: Workshop on physics at current accelerators and the supercollider, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE94002217. Source: OSTI; NTIS; INIS; GPO Dep.

The authors summarize the results of the extended gauge group working group of the Madison-Argonne Workshop on Present and Future Colliders. Contributions are described on the previously unexamined two photon fusion production of heavy leptons, new studies of Z′ couplings to $\nu\bar{\nu}$ and $q\bar{q}$, and previously unexplored vector leptoquark production. More detailed accounts of these studies can be found in individual contributions.

2354 (ANL-HEP-CP-93-67) **High energy asymptotics of perturbative multi-color QCD.** Lipatov, L.N. (St. Petersburg Nuclear Physics Inst., Gatchina (Russian Federation)). Argonne National Lab., IL (United States). 26 Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9306221–7: 19 international conference on elastic and diffractive scattering (5th Blois workshop), Providence, RI (United States), 8-12 Jun 1993). Order Number DE94001350. Source: OSTI; NTIS; INIS; GPO Dep.

The structure functions of deep-inelastic scattering at small-x satisfy two different equations in the leading logarithmic approximation (LLA). The first one – the GLAP equation, describes the Q^2-evolution of partonic distributions $h_i(x)$. The second one – the BFKL, equation determines the x-dependence of parton densities $H_i(x, k_\perp)$. Analogous equations for matrix elements of higher twist operators were constructed in Refs. 3 and 4. Here the author discusses the possibility of finding an exact solution for multi-gluon compound states in LLA for the color group SU(N), in the limit $N \to \infty$. The contributions of diagrams with many reggeized gluons are important for the unitarization of the perturbative Pomeron in QCD. It is shown that the Bethe-Salpeter equations for compound states of many reggeized gluons are conformally invariant in the two-dimensional impact parameter space. Their solutions can be written in holomorphically factorized form and there is a differential operator commuting with the holomorphic part of the corresponding Hamiltonian.

2355 (BNL–49445) **Techniques in meson spectroscopy.** Longacre, R.S. Brookhaven National Lab., Upton, NY (United States). [1991]. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-910864–15: 4. international conference on hadron spectroscopy, College Park, MD (United States), 12-16 Aug 1991). Order Number DE93041120. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains lectures on the following topics: the quark model and beyond using quantum chromodynamics; analysis of formation reactions; energy dependence of the partial wave amplitudes; where the data for the t-matrix analysis comes from; and coupled channel analysis of isoscalar mesons.

2356 (BNL–49448) **Effective Lagrangian for gluons and Higgs pseudoscalars.** Kauffman, R.P.; Schaffer, W. Brookhaven National Lab., Upton, NY (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9306176–10: Workshop on physics at current accelerators and the supercollider, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE94001381. Source: OSTI; NTIS; INIS; GPO Dep.

Models of electroweak symmetry breaking with more than a single doublet of Higgs scalars contain a neutral pseudoscalar boson. The production of such a pseudoscalar in hadron collisions proceeds primarily via gluon fusion through a top-quark loop (except for those models in which the pseudoscalar coupling to bottom quarks is strongly enhanced). The authors compute the QCD corrections to this process in the heavy-quark limit, using an effective Lagrangian derived from the axial anomaly.

2357 (DOE/ER/40412–1) **[The study of hadronic matter at the highest energy density: The search for the deconfined quark-gluon phase using 2 TeV p-p collisions]: Progress report.** Purdue Research Foundation, Lafayette, IN (United States). [1988]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER40412. Order Number DE94000785. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses research on the following topics: Energy dependence of proton induced xenon fragmentation and the approach to liquid gas criticality in nuclear matter; the multiplicity dependence of the transverse momentum spectrum for centrally produced hadrons in proton-antiproton collisions; mass identified particle yields in proton-antiproton collisions; lambda particle production from proton-antiproton collisions; central tracking chamber installation and performance; software development; and research and development on parallel plate avalanche chambers.

2358 (FNAL/C–93/268) **Heavy flavor spectroscopy.** Rosen, J. (Northwestern Univ., Evanston, IL (United States)); Marques, J.; Spiegel, L. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9306258–2: Workshop on B physics at hadron colliders, Snowmass, CO (United States), Jun 1993). Order Number DE94001499. Source: OSTI; NTIS; INIS; GPO Dep.

As a useful by-product of the unfolding searches for mixing and CP-violation effects in the beauty sector there will accrue very large data samples for the study of heavy flavor spectroscopy. Interest in this field may be provisionally divided into two general classes: Hidden flavor states, i.e. $c\bar{c}$ and $b\bar{b}$ onium states; open flavor states: The D, D_s, B, B_s, and B_c meson systems; and charm and beauty flavored baryons. In this brief note we emphasize that there are many missing states in both categories – states which are not readily produced exclusively due to quantum number preferences or states which are not readily observed inclusively due to experimentally difficult decay channels. As recorded luminosities increase it may be possible to fill in some of the holes in the present listings of heavy flavor states. Of particular interest to us would be the identification of heavy flavor mesons which are not easily explained in terms of a $q\bar{q}$ paradigm but rather may be evidence for hadromolecular states. At Snowmass 1993 the topic of self-tagging schemes in B meson production was very much in vogue. Whether or not excited B-meson flavor-tagging will prove to be competitive with traditional methods based on the partner $\bar{B}$ decay remains to be seen. We suggest however that the richness of the excited B-system may undermine the efficacy of self-tagging schemes.

2359 (INP-MSU–92-37-286) **Comparison of the factorial moments in p-barp-, pp- and K^-p- interactions at 32 GeV/c.** Bravina, L.V. (and others); Zabrodin, E.E.; Kodolova, O.L. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 14p. (In Russian). (NIIYaF-MGU–92-37-286.). Order Number DE94606441. Source: OSTI; NTIS (US Sales Only); INIS.

Intermuttency effects have been studied in p-bar-p-, $K^-p^-$and pp- interactions at 32 GeV/c. The factorial moments are given for the rapidity and azimuthal angle distributions for all charged particles. A comparison was made with the predictions of the quark-gluon string model and with the data of other experiments. 11 refs.; 4 figs.; 2 tabs.

2360 (JINR-E–2-92-136) **The proper field of charges and cauge-invariant variables in electrodynamics.** Shabanov, S.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 18p. Order Number DE94606405. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Phys., A Math. Gen.

According to Dirac it follows from the gauge invariance requirement for physical dynamical variables in electrodynamics that charges are created and annihilated together with their proper (Coulomb) field that induces the static (Coulomb) interaction of charges. It is shown that in electrodynamics these is an infinite number of ways to determine gauge-invariant variables. The proper field configuration of charges depends on the choice of thise variables and may differ from the Coulomb one. 12 refs.; 1 fig.

2361 (JINR-E–2-92-173) **NJL model with gluon condensate at finite temperature.** Ebert, D. (Humboldt-Universitaet, Berlin (Germany). Sektion Physik); Kalinovskij, Yu.L.; Volkov, M.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 10p. Order Number DE94606413. Source: OSTI; NTIS (US Sales Only); INIS.

The QCD-motivated Nambu-Jona-Lasinio model with gluon condensate at finite temperature and baryon number density are considered. The behaviour of the constituent quark mass, quark condensates, meson masses and coupling constants of mesons embedded into a hot and dense medium is studied. 15 refs.; 5 figs.

2362 (JINR-E–2-92-361) **The small-x behaviour of parton distribution functions.** Kotikov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 15p. Order Number DE94606414. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The analysis of parton distributions for the small-x region Bjorken variables is given. It is shown how the inclusion of the next-to-leading corrections to the anomalous dimentions of the Wilson operators changes the behaviour of Q^2-evolution of parton distributions. For 'conventional' (nonsingular for $x \to 0$) choise of parton distributions this change is determined by the values of anomalous dimensions. 20 refs.

2363 (JINR-E-2-92-388) **Deep inelastic lepton scattering on nuclei: operator product expansion and meson-nucleon theory.** Kaptari, L.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Umnikov, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 26p. Order Number DE94606442. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Phys., A.

A novel point of view on the x-rescaling model in lepton-nucleous deep inetic scattering is suggested. Using the operator product expansion method within the effective meson-nucleon theory, a rigorous consideration of the scattering on the deuteron is presented. It is demonstrated that with the contributions interpreter as the Fermi motion corrections, the x-rescaling idea is exactly reproduced. The diagrams of scattering of bound nucleons have also been computed numerically. An example of application of the method, viz. the problem of extraction of the neutron structure function from the combined proton-deuteron data, is considered. 26 refs.; 5 figs.

2364 (JINR-E-2-93-25) **Axial anomaly in $e^+e^- \to \gamma\gamma$ and anyon superconductivity.** Teryaev, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 8p. Order Number DE94606406. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Lett., Sect. B.

The spin-dependent total cross-section of $e^+e^- \to \gamma\gamma$ is shown to have a $\delta(q^2)$ singularity for $m_e \to 0$. The relation to some problems of anyon superconductivity is discussed. 23 refs.; 2 figs.

2365 (JINR-E-2-93-56) **Excited Landau levels, orbital angular momentum and axial anomaly.** Teryaev, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 7p. Order Number DE94606407. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Mod. Phys. Lett. A.

The IR cutoff via the exclusion of the high orbital momentum components for the excited Landau levels leads to the physical interpretation of the cancellation between the explicity and anomalous chiral symmetry breaking. 21 refs.

2366 (JINR-E-2-93-118) **Stochastic space-time, confinement potential and particle propagator.** Namsrai, Kh. (Mongolian Academy of Sciences, Ulan-Bator (Mongolia). Inst. of Physics and Technology). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 8p. Order Number DE94606415. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Int. J. Mod. Phys. A.

Stochastic space-time caused by random strings is considered. Confinement potential and particle propagator are calculated in this induced gravitation. It turns out that force-transmitting quanta become nonlocal and unobservable. Quantum field theory of such objects is nonlocal and free from ultraviolet divergences. 4 refs.; 1 fig.; 1 tab.

2367 (LA-UR-93-3227) **Time evolution of the quark-gluon plasma.** Cooper, F. (Los Alamos National Lab., NM (United States)); Kluger, Y.; Dawson, J.; Shepard, H. Los Alamos National Lab., NM (United States). 30 Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308181–1: Pre-equilibrium Parton dynamics, Berkeley, CA (United States), 23 Aug - 3 sep 1993). Order Number DE94000804. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the time evolution of the quark-gluon plasma.

2368 (SLAC-PUB–6304) **New perspectives in quantum chromodynamics.** Brodsky, S.J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jul 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9305282–1: Particle physics at the fermi scale workshop, Beijing (China), 27 May - 4 jun 1993). Order Number DE93041021. Source: OSTI; NTIS; INIS; GPO Dep.

In these lectures I will discuss three central topics in quantum chromodynamics: (1) the use of light cone quantization and Fock space methods to determine the long and short-distance structure of quark and gluon distributions within hadrons; (2) the role of spin, heavy quarks, and nuclei in unraveling fundamental phenomenological features of QCD; and (3) a new approach to understanding the scale and scheme dependence of perturbative QCD predictions.

6623 Specific Interactions, Decays and Processes

Refer also to citation(s) 1648, 2312, 2334, 2355, 2357, 2407, 2415, 2460, 2515

2369 (ANL-HEP-CP–93-51) **Using invisible decay modes as probes of Z′ couplings.** Hewett, J.L.; Rizzo, T.G. Argonne National Lab., IL (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9306176–8: Workshop on physics at current accelerators and the supercollider, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE94001349. Source: OSTI; NTIS; INIS; GPO Dep.

We explore the possibility that Z′ couplings can be probed using decay modes which involve neutrinos once Standard Model backgrounds are directly determined by the data itself. For some models, sufficient statistics are available at either the SSC or LHC to render these modes useful for coupling determinations, provided the mass of the Z′ is not much large than 1 TeV, if we assume other new physics background sources are absent.

2370 (ANL-HEP-CP–93-63) **Bottom quark cross sections at collider and fixed-target energies at the SSC and LHC.** Berger, E.L. (Argonne National Lab., IL (United States)); Meng, R. Argonne National Lab., IL (United States). Aug 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CERN-TH–6987/93;CONF-9306258–1: Workshop on B physics at hadron colliders, Snowmass, CO (United States), Jun 1993). Order Number DE94000442. Source: OSTI; NTIS; INIS; GPO Dep.

Calculations of inclusive cross sections for the production of bottom quarks in proton-proton collisions are presented as a function of energy, transverse momentum, and Feynman x_F for values of $\sqrt{s}$ from 100 GeV to 40 TeV. In addition, we provide simple parametrizations of our theoretical results that should facilitate estimates of rates, acceptances, and efficiencies of proposed new detectors.

2371 (ANL-HEP-CP–93-68) **Extended gauge sectors at linear colliders.** Hewett, J.L. Argonne National Lab., IL (United States). Aug 1993. 24p. Sponsored by USDOE, Washington, DC (United States); Texas National Research Lab. Commission, De Soto, TX (United States). DOE Contract W-31109-ENG-38. (CONF-930449–7: International workshop on physics and instrumentation at future linear colliders, Kona, HI (United States), 26-30 Apr 1993). Order Number DE94001271. Source: OSTI; NTIS; INIS; GPO Dep.

Signatures of extended gauge models at high energy e^+e^- linear colliders are summarized.

2372 (ANL-HEP–TR-91-13) **SDC hadronic mass resolutions in Z and Z′ decays.** Blair, R.E.; Price, L.E.; Trost, H.J. Argonne National Lab., IL (United States). Dec 1990. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040805. Source: OSTI; NTIS; INIS; GPO Dep.

In order to investigate the performance as a function of calorimeter characteristics, events were simulated in the SDC detector for Z and Z′ ($m_{Z'}$ = 1TeV) production at two different P_T values (50GeV/c and 500GeV/C). This initial study concentrated on the effects of clustering (including jet fragmentation fluctuations and contributions from underlying events), segmentation and calorimeter energy resolution. These studies were intended to explore the capabilities of the SDC detector for reconstruction of hadronic decays of massive particles (Z mass or greater). We find that detector-independent

contributions dominate the mass resolution for the range of parameters being considered by SDC.

2373 (ANL/PHY/CP–80703) **Studies of the deuteron at high energy and momentum transfer.** Holt, R.J. Argonne National Lab., IL (United States). 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9307145–1: Workshop on electron nucleus scattering, Elba (Italy), 5-10 Jul 1993). Order Number DE93041162. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of the tensor analyzing power T_{20} are in progress at the 2-GeV electron storage ring (VEPP-3) in Novosibirsk. Preliminary results from the second phase of this experiment will be presented along with a discussion of the theoretical implications of the existing data. Measurements of the $\gamma d \rightarrow pn$ reaction at photon energies above $\approx$ 1 GeV were performed at SLAC during experiments NE8 and NE17. The results for experiment NE8 are final while those for NE17 are preliminary. The results appear to be consistent with the constituent scaling law near θ_{CM}=90°, but inconsistent with the rule at a forward angle.

2374 (BNL–49453) **Low p_T photon production in proton-nucleus collisions at 18 GeV/c.** Lissauer, D. (Brookhaven National Lab., Upton, NY (United States)); Takai, H.; Woody, C. Brookhaven National Lab., Upton, NY (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930636–6: 10. international conference on ultra-relativistic nucleus-nucleus collisions, Borlaenge (Sweden), 20-24 Jun 1993). Order Number DE94001380. Source: OSTI; NTIS; INIS; GPO Dep.

The inclusive single photon spectrum has been measured in the p_T range from a few MeV/c up to approximately 1 GeV/c at several rapidities in the interval from $-2.1 < y_{cm} < +0.5$ in 18 GeV/c proton-beryllium and proton-tungsten collisions at the Brookhaven AGS. The measured photon distributions are compared with the expected distribution of photons from π^0 decays and hadronic bremsstrahlung in a search for new sources of "soft" photons at low transverse momentum.

2375 (BNL–49462) **The $t\bar{t}\gamma$ background to $pp \rightarrow W\gamma + X$ at the SSC.** Baur, U. (Florida State Univ., Tallahassee, FL (United States). Physics Dept.); Stange, A. Brookhaven National Lab., Upton, NY (United States); Florida State Univ., Tallahassee, FL (United States). Dept. of Physics. Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ;FG05-87ER40319. (FSU-HEP–930830;CONF-9306176–9: Workshop on physics at current accelerators and the supercollider, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE94001386. Source: OSTI; NTIS; INIS; GPO Dep.

The authors calculate the $pp \rightarrow t\bar{t}\gamma + X \rightarrow W\gamma + X$ cross section at SSC energies. Approximately 40% of the total cross section originates from photon bremsstrahlung off the final state jet in $t\bar{t}j$ production. Without cuts restricting the hadronic activity, the $t\bar{t}\gamma$ rate is a factor 10 (2) larger than the tree level $W\gamma$ cross section for a top quark mass of 110 GeV (200 GeV). Imposing a jet veto cut, the $t\bar{t}\gamma$ rate can be suppressed to a level well below the $W\gamma$ + 0 jet signal cross section.

2376 (BNL–49500) **Strange hadronic matter.** Dover, C.B. (Brookhaven National Lab., Upton, NY (United States)); Millener, D.J.; Gal, A.; Greiner, C.; Schaffner, J.; Stoecker, H. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930637–8: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94001493. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have investigated the domain of stability of multi-strange hadronic systems, made up of nucleons and hyperons {p, n, Λ, Ξ^0, Ξ^-} in a relativistic mean field approach. They find a large class of such objects which are stable against strong decay, including the bulk limit $A \rightarrow \infty$. Using interactions tailored to reproduce the observed binding energies of Λ, Ξ and $\Lambda\Lambda$ hypernuclei, they estimate binding energies per baryon as large as $E_B/A \approx -22$ MeV, with large strangeness per baryon $f_s \approx 1$–1.2 and small charge per baryon $f_q \approx -0.1$ to 0. These multi-strange systems have typical baryon densities of 2–3 times that of ordinary nuclear matter.

2377 (BNL–49501) **Hybrid mesons ($Q\bar{Q}g$) in $N\bar{N}$ annihilation.** Dover, C.B. (Brookhaven National Lab., Upton, NY (United States)); Gutsche, T.; Faessler, A. Brookhaven National Lab., Upton, NY (United States). Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States); Deutsche Forschungsgemeinschaft, Bonn (Germany); Alexander von Humboldt-Stiftung, Bonn (Germany). DOE Contract AC02-76CH00016. (CONF-930637–7: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94001491. Source: OSTI; NTIS; INIS; GPO Dep.

$N\bar{N}$ annihilation reactions provide exciting possibilities to study mesonic resonances beyond the usual $Q\bar{Q}$ spectrum. Particularly the search for $Q\bar{Q}g$ mesons containing an explicit dynamical excitation of the gluon field is not promising, since hybrids are predicted to display unique features: exotic quantum numbers ($J^{\pi C}$) and dynamical selection rules for their decay modes. The authors have investigated the possibility of producing hybrids from $p\bar{p}$ atomic states in reactions of the type $N\bar{N}(L= 0,1) \rightarrow \pi + Q\bar{Q}g$. Production rates for hybrid mesons are found to display a strong dependence on the quantum numbers and kinematical factors associated with the transition. The dependence on the orbital angular momentum L of the $p\bar{p}$ atomic state, accessible in $p\bar{p}$ annihilation at rest, would provide a striking signature for the production of hybrids. In estimating branching ratios for the formation of $Q\bar{Q}g$ hybrid mesons in $N\bar{N}$ annihilation reactions at rest, the authors have employed a microscopic model with constituent quarks and gluons in analogy to the annihilation model for the production of $Q\bar{Q}$ mesons.

2378 (CONF-880867–28) **Jet production in $\gamma\gamma$ interactions at PEP.** TPC/Two-Gamma Collaboration. Massachusetts Univ., Amherst, MA (United States). [1988]. 21p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC02-85ER40194. From 24. international Rochester conference on high energy physics; Munich (Germany); 4-10 Aug 1988. Order Number DE93019136. Source: OSTI; NTIS; INIS; GPO Dep.

We have used the TPC/Two-Gamma Facility at the SLAC e^+e^- storage ring PEP to study the photon-photon reaction $e^+e^- \rightarrow e^+e^-$ + hadrons, in both the single-tagged mode (one outgoing $e^\pm$ detected) and the untagged mode (neither $e^\pm$ detected). A thrust algorithm was used to find the jet axis in the hadronic center-of-mass, and this axis was used to calculate the transverse momentum with respect to the $\gamma\gamma$ collision axis (p_t). The (preliminary) p_t and thrust distributions of both tagged and untagged data are well-described by the predictions of vector meson dominance (VDM) at low p_t. For $3 < p_t < 4.5$ GeV, the tagged data are consistent with the prediction of the Quark Parton Model (QPM). In the intermediate region – $1.5 < p_t < 3$ GeV – an excess of events is seen in both samples. The p_t and event topology of these excess events are compared to a 3-jet model based on QCD.

2379 (DOE/ER/00881–T4) **A measurement of the forward-backward asymmetry and $\sin^2\theta_W$ from the process $Z^0 \rightarrow \mu^+\mu^-$ at $\sqrt{s}$ = 1.8 TeV.** Markosky, L.A. Wisconsin Univ., Madison, WI (United States). 1992. 224p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76ER00881. Order Number DE94001908. Source: OSTI; NTIS; INIS; GPO Dep.

A measurement of the forward-backward charge asymmetry in the decay of Z^o bosons produced from $\bar{p}p$ collisions at $\sqrt{s}$ = 1.8 TeV at the Fermilab Tevatron collider, and decaying to μ^+ μ^- pairs is presented. From this asymmetry, a value for the Weinburg angle, $\sin^2\theta_W$, is extracted and compared to values from other experiments.

2380 (DOE/ER/40150–236) **Momentum and coordinate space three-nucleon potentials.** Coon, S.A. (New Mexico State Univ., Las Cruces, NM (United States). Dept. of Physics); Pena, M.T. New Mexico State Univ., Las Cruces, NM (United States). Dept. of Physics; Continuous Electron Beam Accelerator Facility, Newport News, VA (United States). 10 Jun 1993. 32p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States); North Atlantic Treaty

Organization, Brussels (Belgium). DOE Contract AC05-84ER40150. (CEBAF-TH-93-09). Order Number DE93040868. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper we give explicit formulae in momentum and coordinate space for the three-nucleon potentials due to ρ and π meson exchange, derived from off-mass-shell meson-nucleon scattering amplitudes which are constrained by the symmetries of QCD and by the experimental data. Those potentials have already been applied to nuclear matter calculations. Here we display additional terms which appear to be the most important for nuclear structure. The potentials are decomposed in a way that separates the contributions of different physical mechanisms involved in the meson-nucleon amplitudes. The same type of decomposition is presented for the $\pi - \pi$ TM force: The Δ isobar, the chiral symmetry breaking and the nucleon pair terms are isolated.

2381 (FNAL/C–93/009-E) **Sparticle searches at CDF.** Hu, Ping. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1992. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94002301. Source: OSTI; NTIS; INIS; GPO Dep.

A set of jet events with large amount of Missing E_T (E_t) from the Fermilab CDF experiment was analysed to search SUSY signature. The absence of the signal resulted in squark and glunio mass limits ($m\tilde{q} > 126$ GeV/c^2 and $m\tilde{g} > 141$ GeV/c^2). Some effects of some SUSY parameters on the squark and glunio mass limits are presented.

2382 (FNAL/C–93/180-E) **B production at CDF.** Papadimitriou, V. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jul 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930363–10: 28. conference on quantum chromodynamics and high energy hadronic interactions, Les Arcs (France), 13-27 Mar 1993). Order Number DE94000576. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper we present results on B production obtained from data taken with the CDF detector at Fermilab, in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV. b-quark production cross sections using exclusive and inclusive B decay modes are presented and compared with theoretical predictions. We cover recently completed analyses of the 1988–1989 data and describe the first preliminary results of the studies of the 1992–1993 collider run. Prospects for the near future are also discussed.

2383 (FNAL/C–93/197) **Summary of the Hadronic Weak Interaction session.** Bock, G. (Fermi National Accelerator Lab., Batavia, IL (United States)); Bryman, D.A.; Numao, T. Fermi National Accelerator Lab., Batavia, IL (United States). Jul 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (TRI-PP–93-68;CONF-930389–23: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). Order Number DE94000592. Source: OSTI; NTIS; INIS; GPO Dep.

We summarize and discuss present and future experiments on decays of light mesons and muons that were presented in the Hadronic Weak Interaction working group session of the "Workshop on Future Directions in Particle and Nuclear Physics at Multi-GeV Hadron Facilities." Precise measurements and rare-decay searches, which sense mass scales in the 1–1000 TeV region, are discussed in the context of the standard model and beyond.

2384 (FNAL/C–93/216-E) **Status of Fermilab E-710.** Rubinstein, R. E-710 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States); North Atlantic Treaty Organization, Brussels (Belgium). DOE Contract AC02-76CH03000. (CONF-9306221–4: 19 international conference on elastic and diffractive scattering (5th Blois workshop), Providence, RI (United States), 8-12 Jun 1993). Order Number DE94001216. Source: OSTI; NTIS; INIS; GPO Dep.

This report give the current status of E-710, an experiment at the Fermilab $\bar{p}p$ Tevatron Collider to measure elastic scattering, total cross sections and diffraction dissociation up to $\sqrt{s}$ = 1.8 TeV.

2385 (FNAL/C–93/251) **Toward a QCD analysis of jet rates in deep-inelastic Muon-Proton scattering.** Salgado, C.W. E665 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9306176–7: Workshop on physics at current accelerators and the supercollider, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE94000618. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of multi-jet production rates in deep-inelastic Muon-Proton scattering at Fermilab-E665 are presented. Jet rates defined by the JADE clustering algorithm are compared to perturbative Quantum chromodynamics (PQCD) and different Monte Carlo model predictions. The applicability of the jet-parton duality hypothesis is studied. We obtain hadronic jet rates which are approximately a factor of two higher than PQCD predictions at the parton level. Possible causes for this discrepancy are discussed.

2386 (FNAL/C–93/252-E) **Jet production in muon-proton and muon-nuclei scattering at Fermilab-E665.** Salgado, C.W. E665 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9306221–3: 19 international conference on elastic and diffractive scattering (5th Blois workshop), Providence, RI (United States), 8-12 Jun 1993). Order Number DE94000597. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of multi-jet production rates from Muon-Proton Muon- Nuclei scattering at Fermilab-E665 are presented. Jet rates are defined by the JADE clustering algorithm. Rates in Muon-Proton deep-inelastic scattering are compared to perturbative Quantum Chromodynamics (PQCD) and Monte Carlo model predictions. We observe hadronic (2+1)-jet rates which are a factor of two higher than PQCD predictions at the partonic level. Preliminary results from jet production on heavy targets, in the shadowing region, show a suppression of the jet rates as compared to deuterium. The two- forward jet sample present higher suppression as compared to the one-forward jet sample.

2387 (FNAL/C–93/266) **Blois V: Experimental summary.** Albrow, M.G. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9306221–6: 19 international conference on elastic and diffractive scattering (5th Blois workshop), Providence, RI (United States), 8-12 Jun 1993). Order Number DE94001219. Source: OSTI; NTIS; INIS; GPO Dep.

The author gives a summary talk of the best experimental data given at the Vth Blois Workshop on Elastic and Diffractive Scattering. He addresses the following eight areas in his talk: total and elastic cross sections; single diffractive excitation; electron-proton scattering; di-jets and rapidity gaps; areas of future study; spins and asymmetries; high-transverse momentum and masses at the Tevatron; and disoriented chiral condensates and cosmic radiation.

2388 (FNAL/C–93/271-E) **Average and individual B hadron lifetimes at CDF.** Schneider, O. (Lawrence Berkeley Lab., CA (United States)). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9307143–2: 5. international symposium on heavy flavor physics, Montreal (Canada), 6-10 Jul 1993). Order Number DE94001218. Source: OSTI; NTIS; INIS; GPO Dep.

Bottom hadron lifetime measurements have been performed using $B \rightarrow J/\psi \rightarrow \mu^+\mu^-X$ dacays recorded with the collider Detector at Fermilab (CDF) during the first half of the 1992–1993 Tevatron collider run. These decays have been reconstructed in a silicon vertex detector. Using 5344 $\pm$ 73 inclusive J/ψ events, the average lifetime of all bottom hadrons produced in 1.8 TeV $p\bar{p}$ collisions and decaying into a J/ψ events, the average lifetime of all bottom hadrons produced in 1.8 TeV $p\bar{p}$ collisions and decaying into a J/ψ is found to be 1.46 $\pm$ 0.06(stat) $\pm$0.06(sys)ps. The charged and neutral B meson lifetimes have been measured separately using 75 $\pm$10 (charged) and 61$\pm$9 (neutral) fully reconstructed decays; preliminary results are $\tau^{\pm}$ = 1.63 $\pm$ 0.21(stat) $\pm$ 0.16(sys) $\pm$ 0.10(sys) ps, yielding a lifetime ratio of $\tau^{\pm}/\tau^0$ = 1.06$\pm$ 0.20(stat)$\pm$0.12(sys).

2389 (FNAL/C–93/273-E) **Search for the top quark at D0.** Narain, M. D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930363–11: 28. conference on quantum chromodynamics and high energy hadronic interactions, Les Arcs (France), 13-27 Mar 1993). Order Number DE94001221. Source: OSTI; NTIS; INIS; GPO Dep.

We present preliminary results on the search for the top quark in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV by the Dv collaboration at the Fermilab Tevatron. The data presented correspond to an integrated luminosity of about 7.5 pb^{-1}. We have conducted searches in the electron-muon ($e\mu$) and the dielectronic (ee) top decay channels. One $e\mu$ event was found. We obtain a lower limit on the top mass of 99 GeV/c^2 at 95% C.L.

2390 (JINR-E–2-92-106) **Semileptonic heavy-to-light decays of baryons.** Efimov, G.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Ivanov, M.A.; Kulimanova, N.B.; Lyubovitskij, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 24p. Order Number DE94606481. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Z. Phys., C.

The results about semileptonic decays of baryons with only heavy quark into light baryons are reported. These processes are considered in the framework of the quark confinement model. Weak form factors, decay rates and differential distributions of semileptonic heavy-to-light baryon decays are calculated. The limit $m_Q \to \infty$ is examined. 23 refs.; 14 figs.; 1 tab.

2391 (JINR-E–2-92-368) **Possible explanation of the interaction cross-section growth at high energies.** Belyakov, V.A.; Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 4p. Order Number DE94606457. Source: OSTI; NTIS (US Sales Only); INIS.

On the basis of the relativized Yukawa potential it is shown that the mowing hadron transverse size grows with increasing its energy $\approx(\ln\gamma)^{0.8}$ (γ is the Lorentz factor). The opinion is expressed that the known growth of the interaction cross section at high energies is due to the indicated reason. 9 refs.; 1 tab.

2392 (JINR-E–2-93-88) **Proton electromagnetic form factor near the proton-antiproton threshold and quasinuclear bound state.** Meshcheryakov, G.V.; Meshcheryakov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 8p. Order Number DE94606458. Source: OSTI; NTIS (US Sales Only); INIS.

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The influence of the PP-bar-state in the unitarity condition on the behavior of the proton form factor in the time-like region is considered. The result obtained earlier on existence of a quasinuclear bound state in the elastic PP-bar-channel is used to estimate it contribution to electromagnetic form factor of the proton. The obtained expression well describes the high precision data of the experiment PS-170 performed at LEAR at CERN and indicates the quantum numbers of the quasinuclear PP-bar bound state near threshold. 18 refs.; 2 figs.

2393 (JINR-E–3-92-417) **Neutron-neutron scattering - possibility of in-beam experiment.** Pokotilovskij, Yu.N.; Takhtamyshev, G.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 7p. Order Number DE94606459. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Lett., Sect. B.

The possibility experiment on a direct mesuremenet of the neutron-neutron scattering length is discussed, consisting in registration of both neutrons after their scattering in a collimated thermal neutron beam from the reactor. Some results of the Monte-Carlo simulation of the experiment are given and peculiarities and advantages of this approach are discussed and compared with the earlier suggested one. 2 refs.; 5 figs.

2394 (JINR-R–1-92-131) **On the $\pi^+ \to \mu^+ + e^+ + e^- + \nu_\mu$ decay.** Baranov, V.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Korenchenko, S.M.; Kostin, B.F.; Kravchuk, N.P.; Kuchinskij, N.A.; Mzhaviya, D.A.; Tsamalaidze, Z.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 6p. (In Russian). Order Number DE94606473. Source: OSTI; NTIS (US Sales Only); INIS.

The simulation of the decay process detection $\pi^+ \to \mu^+ e^+ e^- \nu_\mu$ at fly on the ARES facility has been done. The total probability of the decay process was calculated. Using the real matrix element the deposites of internal bremsstrahlung, structural radiation and its interference have been obtained, the relative decay probability $\pi^+ \to \mu^+ e^+ e^- \nu_\mu$ is found R_{IB}=0,33x10^{-6}. The momentum and angular distributions have been calculated. 7 refs.; 5 figs.; 1 tab.

2395 (JINR-R–2-92-151) **On the contribution of bremsstrahlung to the ptoduction of a lepton pairs at intermediate energies.** Bratkovskaya, E.L. (Dal'nevostochnyj Gosudarstvennyj Univ., Vladivostok (Russian Federation)); Reznik, B.L.; Titov, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 14p. (In Russian). Order Number DE94606460. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The contribution of bremsstrahlung to the production of a lepton pairs in pd-interaction with an initial energy of 1-5 GeV is analyzed. It is shown that the contribution of the cross section of yield of bremsstrahlung dileptons with masses close to those of ρ, ω-mesons is essentially suppressed provided that the virtuals in the two-body T matrix is considered off-mass-shell. 17 refs.; 5 figs.; 2 tabs.

2396 (JINR-R–2-93-44) **Masses and mixing of leptons and quarks (Dirac particles).** Beshtoev, Kh.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 6p. (In Russian). Order Number DE94606446. Source: OSTI; NTIS (US Sales Only); INIS.

The work is devoted to the discussion of the question on influence of different types of interactions on the mass matrix of leptons and quarks. The conclusion is made that electromagnetic and strong interactions do not influence on nondiagonal elements of the mass matrix of leptons and quarks. It is shown, for specific (left) character of weak interaction, the interaction does not contribute to the mass matrix of leptons and quarks and so does not lead to the mixing of leptons and quarks due to the masses. 5 refs.

2397 (LA-UR–93-3006) **Pions and neutrinos as probes of the nucleon and nuclear few-body system.** Hoffman, C.M. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308164–1: 14. European conference on few-body problems in physics, Amsterdam (Netherlands), 22-27 Aug 1993). Order Number DE93040127. Source: OSTI; NTIS; INIS; GPO Dep.

A number of studies of few-body nucleon and nuclear systems are being pursued at LAMPF using pions and neutrinos as probes. These include: a high-statistics measurement of the cross section for the reaction $\pi^+ p \to \pi^+ \pi_o \pi^0$ to determine the 1 = 2 $\pi\pi$ scattering length; precision measurements of the $\pi^- p$ charge exchange cross section in the region of the A; measurements of the cross section for the ($\pi^+ p \to \pi^+ \pi^+$ p), from D, ^{3}He as ^{4}He as tests of charge symmetry and reaction mechanisms; measurements of the $\pi^+ p$ cross section below the Δ; and studies of vp elastic scattering at low Q^2 to determine the quark content of the proton spin. Some of these experiments acquired data last year, while others are presently running. LAMPF, the highest power proton accelerator in the world, is presently in the midst of its 1993 production run.

2398 (NEI-NO–361) **Virtual two-loop corrections to Bhabha scattering.** Bjoerkevoll, K.S. Bergen Univ. (Norway). Mar 1992. 191p. Order Number DE94606447. Source: OSTI; NTIS; INIS.

Reprints of three previously printed papers are attached.

The author has developed methods for the calculation of contributions from six ladder-like diagrams to Bhabha scattering. The leading terms both for separate diagrams and for the sum of the gauge-invariant set of all diagrams have been calculated. The study has been limited to contributions from Feynman diagrams

without real photons, and all calculations have been done with $s >> -t- >> m^2$, where s is the center of mass energy squared, t is the square of the transferred four-momentum, and m is the electron mass. For the separate diagrams the results depend upon how λ^2 is related to s, -t- and m^2, whereas the leading term of the sum of the six diagrams is the same in the cases that have been considered. The methods described should be valuable for calculations of contributions from other Feynman diagrams, in particular QED corrections to Bhabha scattering or pair production at small angles. 23 refs., 5 figs., 5 tabs.

2399 (SLAC-PUB–6109) **Baked Alaska.** Bjorken, J.D. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Kowalski, K.L.; Taylor, C.C. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1993. 12p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00515. Contract NSF-PHY-9208651. (CONF-9303172–4: 1993 Rencontres de Physique de La Vallee D'Aoste, LaThuile (Italy), 8-13 Mar 1993). Order Number DE93040958. Source: OSTI; NTIS; INIS; GPO Dep.

We speculate that, in the interiors of large "fireballs" produced in very high-energy collisions, vacuum states of the strong interactions are produced with anomalous chiral order parameters. If true this can lead to anomalously large fluctuations in the charged-to-neutral ratio of produced hadrons (Centauro and anti-Centauro behavior). We also discuss strategies for an experimental search.

2400 (SLAC-PUB–6225) **Studies of QCD B-physics and jet handedness at SLD.** Burrows, P.N. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Lab. for Nuclear Science). The SLD Collaboration. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States). Jun 1993. 6p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States); National Research Council of Canada, Ottawa, ON (Canada). DOE Contract AC03-76SF00515 ;AC02-76ER03069. (CONF-930363–8: 28. conference on quantum chromodynamics and high energy hadronic interactions, Les Arcs (France), 13-27 Mar 1993). Order Number DE93041003. Source: OSTI; NTIS; INIS; GPO Dep.

We present tests of the flavor independence of strong interactions via preliminary measurements of the ratios $\alpha_s/_{alpha\,s}$(udsc) and α_s(uds)/α_s(bc) using data collected by the SLD experiment at SLAC during the 1992 SLD/SLC run. In addition, we have measured the difference in charged particle multiplicity between $Z^0 \rightarrow b\bar{b}$ and $Z^0 \rightarrow u\bar{u}$, $d\bar{d}$, $s\bar{s}$ events, and find that it supports the prediction of perturbative QCD that the multiplicity difference be independent of center-of-mass energy. We have also made a preliminary study of jet polarization and find, using a charge-signed definition, a small net handedness in our sample of hadronic jets.

2401 (SLAC-PUB–6285) **SLD results from the study of polarized Z^0 produced at the SLC.** Piccolo, M. (Istituto Nazionale di Fisica Nucleare, Frascati (Italy). Lab. Nazionale di Frascati). SLD Collaboration. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00515 ;FG03-92ER40701 ;FG03-91ER40618 ;FG02-91ER40672 ;FG02-91ER40677 ;AC03-76SF00098 ;FG02-92ER40715 ;ACGrant PHY-91-13428 PHY-88-17930 PHY-88-19316 PHY-92-03212. (CONF-9303172–5: 1993 Rencontres de Physique de La Vallee D'Aoste, LaThuile (Italy), 8-13 Mar 1993). Order Number DE93041020. Source: OSTI; NTIS; INIS; GPO Dep.

The results obtained during the 1992 run of the SLD detector at the SLC are reviewed together with the general performances of the machine. The first measurement of the left-right asymmetry, the determination of the Z^0 branching ratio to bottom quarks and the measurement of α_s are presented. Current plans and expectations for the 1993 run, when high polarization ($\geq$ 60%) GaAs strained cathodes sources will be used, are described.

2402 (SLAC-PUB–6314) **Photon-photon collisions at the next linear collider: Theory.** Brodsky, S.J. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930449–5: International workshop on physics and instrumentation at future linear colliders, Kona, HI (United States), 26-30 Apr 1993). Order Number DE93041025. Source: OSTI; INIS; NTIS; GPO Dep.

The collisions of photons at a high energy electron-positron collider provide a comprehensive laboratory for testing QCD, electroweak interactions, and extensions of the standard model. It is expected that by using back-scattered laser beams that the effective luminosity and energy of photon-photon collisions will be comparable to that of the primary e^+e^- collisions. In this talk, I will focus on tests of electroweak theory in photon-photon annihilation such as $\gamma\gamma \rightarrow W^+W^-$, $\gamma\gamma \rightarrow$ Higgs boson, and higher-order loop processes, such as $\gamma\gamma \rightarrow \gamma\gamma$, $Z\gamma$ and ZZ. Since each photon can be resolved into a W^+W^- pair, high energy photon-photon collisions can also provide a remarkable background-free laboratory for studying WW collisions and annihilation. I also review high energy $\gamma\gamma$ tests of quantum chromodynamics, such as the scaling of the photon structure function, $t\bar{t}$ production, mini-jet processes, and diffractive reactions.

6624 Properties of Specific Particles and Resonances

Refer also to citation(s) 1551, 2318, 2334, 2370, 2381, 2382, 2389, 2396, 2401, 2440, 2460, 2514

2403 (BNL–49416) **The Status of Glueballs.** Lindenbaum, S.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States); City Coll., New York, NY (United States). 14 Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930389–22: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). Order Number DE93040040. Source: OSTI; NTIS; INIS; GPO Dep.

The Status of Glueballs is presented considering that most popular candidates from among the isoscalars in the $J^{PC} = 0^{++}$, 0^{-+} and 2^{++} channels. It is shown that in the 0^{++} channel the $f_0(1720)$ which was discovered earlier (the $S^*(1720)$) at BNL is highly likely the same state as the SLAC $\theta(1720)$ now that its spin has been found to be 0 instead of the 2 claimed for a long period. In the $^{++}$ channel there is likely a complex of 2-3 states $\zeta/\eta(1280)$, $\lambda/\eta(1420)$ and $\iota/\eta(1520)$ involving at least one extra isosclar. In the 2^{++}, the $g_T(2010)$, $g_T'(2300)$ and $g_T''(2340)$ $\phi\phi$ states found in π^- p $\rightarrow$ $\phi\phi$n (OZI forbidden glueball filter channel) strikingly, approximately, completely break the OZI suppression and comprise within the errors all the $\phi\phi$ cross-section. The only viable explanation of these states in the context of QCD is that they are produced by 1-3 primary 2^{++} glueballs. All alternate explanations in the past 15 years have failed.

2404 (BUP–1992-17) **Gross structure of resonance spectra (including bottomonium).** Gareev, F.A. (Bergen Univ., Dept. of Physics (Norway)); Korovin, P.P.; Ratis, Y.L.; Strokovsky. Bergen Univ. (Norway). Dept. of Physics. Dec 1992. 14p. Order Number DE94606490. Source: OSTI; NTIS; INIS.

Simple arguments are given for the explanation of the gross structure of the spectrum of particle resonances based on the shape resonance conditions, the Heisenberg uncertainty relation and the Bohr correspondence principle. 14 refs., 2 figs., 3 tabs.

2405 (DOE/ER/40150–238) **Production, collection and utilization of very long-lived heavy charged leptons.** Goity, J.L. (Continuous Electron Beam Accelerator Facility, Newport News, VA (United States)); Kossler, W.J.; Sher, M. Continuous Electron Beam Accelerator Facility, Newport News, VA (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84ER40150. (CEBAF-TH–93-07). Order Number DE93040867. Source: OSTI; NTIS; INIS; GPO Dep.

If a fourth generation of leptons exists, both the neutrino and its charged partner must be heavier than 45 GeV. We suppose that he neutrino is the heavier of the two, and that a global or discrete symmetry prohibits intergenerational mixing. In that case, nonrenormalizable Planck scale interactions will induce a very small

mixing; dimension five interactions will lead to a lifetime for the heavy charged lepton of O(1–100) years. Production of such particles is discussed, and it is shown that a few thousands can be produced and collected at a linear collider. The possible uses of these heavy leptons is also briefly discussed.

2406 (DOE/ER/40150–240) **Gauge invariance and the electromagnetic current of composite pions.** Frank, M.R. (Hampton Univ., VA (United States). Dept. of Physics); Tandy, P.C. Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility. [1993]. 13p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC05-84ER40150. Grant HRD91-54080;PHY91-13117. (HUPhy–01-93;CEBAF-TH–93-05). Order Number DE93040869. Source: OSTI; NTIS; INIS; GPO Dep.

The Global Color-symmetry Model of QCD is extended to deal with a background electromagnetic field and the associated conserved current is identified for composite $\bar{q}q$ pion modes of the model. Although the analysis is limited to tree level in the bilocal fields that bosonize the model, the identified photon-pion vertex produces the charge form factor associated with ladder Bethe-Salpeter pion amplitudes. A Ward-Takahashi identity for this vertex is derived in terms of the effective inverse propagator for the equivalent local pion field and the intrinsic ladder Bethe-Salpeter amplitudes. This identity is then used to illustrate gauge invariance by showing that identical vertex information is produced from the gauge change of the free action once proper account is taken of the gauge transformation properties of the bilocal pion fields. Comments are made on the location of the vector dominance mechanism in this treatment.

2407 (FNAL/C–93/203-E) **Probing the gluon distribution with the SS-OS dijet cross-section ratio.** The CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930823–12: Symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94000580. Source: OSTI; NTIS; INIS; GPO Dep.

We present a measurement of the same-side to opposite-side dijet cross-section ratio in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV, using approximately 9.4pb^{-1} of data collected by the Collider Detector at Fermilab during the 1992–1993 run of the Fermilab Tevatron. We show that, for large pseudorapidities and small transverse energies, this ratio is sensitive to the gluon distribution function evaluated at small x. Our measurement shows evidence for a singular gluon distribution in this region.

2408 (FNAL/C–93/212-E) **Top dilepton search at CDF.** The CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930823–14: Symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94002302. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present preliminary results from a search for the top quark in the dilepton channel using data collected by CDF during the 1992–93 Fermilab Collider Run. The dilepton analysis implies a lower limit on the top quark mass of 113 GeV/c^2 at the 95% confidence level, assuming Standard Model decays.

2409 (JINR-D–1-92-534) **Narrow baryonia with open hidden strangeness.** Aleev, A.N. (and others); Balandin, V.P.; Chvyrov, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 23p. Order Number DE94606491. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal Yadernaya Fizika.

A search for baryonia with open and hidden strangeness decaying into strange particles has been carried out in a neutron beam with a mean momentum of 40 GeV/c with the BIS-2 spectrometer at the Serpukhov accelerator. There is a strong indication of the existence of baryonia with negative (M_s) and positive (M-bar$_s$) strangeness, decaying respectively into Λp-bar + pions and Λ-barp + pions. The isotopic spin of the strange baryonia is $\geq$ 3/2. Their mean mass is (3060 ±5 (st.) ± 20 (syst.)) MeV/c^2. There is an indication of the existence of narrow baryonium with hidden strangeness (M_ϕ), decaying into Λp-bar$K^+(+\pi^\pm)$, Λ-bar$pK^-(+\pi^\pm)$ and K^0_spp-bar$K^\pm$. The mean value of its mass is (3260 ±5 (st.) ±20 (syst.)) MeV/c^2. The widths of the searched baryonia are (35 ± 5) MeV/c· The production cross-sections the baryonia in the kinematic region $X_F \geq 0.2$ and $P_t \leq 1$ GeV/c, are (0.3 - 1.0) μb/per nucleon (90% C.L.). 33 refs.; 9 figs.; 4 tabs.

2410 (JINR-E–2-92-547) **Decay constants of heavy mesons in the relativistic potential model with velocity dependent corrections.** Avaliani, I.S. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Sisakyan, A.N.; Slepchenko, L.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 10p. Order Number DE94606495. Source: OSTI; NTIS (US Sales Only); INIS.

In the relativistic model with the velocity dependent potential the masses and leptonic decay constants of heavy pseudoscalar and vector mesons are computed. The possibility of using this potential is discussed. 11 refs.; 4 tabs.

2411 (JINR-R–1-93-64) **On the first pion radial excitation.** Ivan'shin, Yu.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 6p. (In Russian). Order Number DE94606496. Source: OSTI; NTIS (US Sales Only); INIS.

It is possible to make analysis of the experimental data of Bologna - Dubna - Milan collaboration to get out draft results on π-meson's radial excitation in the region 700-800 MeV, which had been predicted in the theoretical investigations. 7 refs.; 4 figs.

2412 (JINR-R–10-92-369) **Simulation of the experiment for investigation of subthreshold K^+ production.** Zrelov, P.V.; Ivanov, V.V.; Komarov, V.I.; Puzynin, A.I.; Khrykin, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 22p. (In Russian). Order Number DE94606497. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Matematicheskoe Modelirovanie.

The program for simulation of the experiment for investigation of subthreshold K^+-production with a 0 deg Facility at TP2 in COSY (Julich, Germany) was created. It gave the possibility to elaborate the method for selection of events connected with subthreshold K^+-production which may be realized in the 1-st order trigger (using the ionization energy losses measurements). It was shown that the reliable detection of K^+ from the secondary particle mass spectrum can be performed with the help of the statistical procedure based on the goodness-of-fit criterion ω_n^2. 16 refs.; 7 figs.; 1 tab.

2413 (JINR-R–15-93-29) **NN-interaction in $^1S_0$-state: virtual level or dibaryon resonance.** Borzakov, S.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 4p. (In Russian). Order Number DE94606492. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The experimental and theoretical evidencies for existing of quasi-stationary state of neutron and proton with $J^\pi=0^+$ are discussed. The experimental methods on such state observation are proposed. 8 refs.

2414 (LBL–33677) **Towards a theory of quark and lepton masses.** Hall, L.J. Lawrence Berkeley Lab., CA (United States). 23 Feb 1993. 10p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00098 ;AC02-76ER01545. Grant PHY-90-21139;PHY-92-19345. (UCB-PTH–93/04;CONF-921261–4: 3. symposium on particles, strings and cosmology and the 16th Texas symposium on relativistic astrophysics conference, Berkeley, CA (United States), 13-18 Dec 1992). Order Number DE94001726. Source: OSTI; NTIS; INIS; GPO Dep.

Has any progress been made on understanding and predicting the 13 parameters which describe the observed masses and mixing angles of the quarks and leptons? Arguments are given in favor of pursuing schemes in which grand unified and family symmetries provide many relations among these 13 parameters. A

sequence of simple assumptions leads to a supersymmetric SO(10) theory with 8 predictions: tan β, M_t, V_{cb}, M_s,M_s/M_d, M_u/M_d, V_{ub} and the amount of CP violation J. These predictions are presented, together with experiments which will test them.

2415 (LBL–34232) **Signal and background in NLO QCD for the search of the intermediate mass Higgs boson at the SSC.** Bailey, B. (Florida State Univ., Tallahassee, FL (United States). Dept. of Physics); Graudenz, D. Lawrence Berkeley Lab., CA (United States). 15 Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (FSU-HEP–930815;CONF-9306253–1: Hadron collider workshop, Argonne, IL (United States), 2-5 Jun 1993). Order Number DE93040637. Source: OSTI; NTIS; INIS; GPO Dep.

The signal and background for the search of the Standard Model Higgs boson in the intermediate mass range 80 GeV < m_H < $2M_Z$ is studied based on calculations of the cross sections in next-to-leading order QCD perturbation theory for the production of the Higgs boson via gluon-gluon fusion and for the hadronic two-photon production. The method of Monte-Carlo integration allows the application of realistic cuts (p_T, rapidity, photon isolation) to the cross section. Results are given for the K-factors of the signal and the background. It turns out that the NLO corrections improve the situation for a Higgs boson mass in the range of 80–120 GeV. Furthermore, the influence of a cut on the transverse momentum of the additional jet produced in the processes gg → Hg, gq → Hq, $q\bar{q}$ → Hg is compared to a similar cut for the background.

2416 (RAL–93-027) **Present status of parton distributions.** Martin, A.D. (Durham Univ. (United Kingdom). Dept. of Physics); Stirling, W.J.; Roberts, R.G. Rutherford Appleton Lab., Chilton (United Kingdom). Apr 1993. 30p. (CONF-9303228–: Workshop on HERA: the new frontier for QCD, Durham (United Kingdom), 22 Mar 1993; DTP–93/22.). Order Number DE94604833. Source: OSTI; NTIS (US Sales Only); INIS.

To appear in Proceedings of the Workshop, J. Phys. G.

We review the present knowledge of the partonic structure of the proton. We compare and contrast the parton distributions obtained recently by two international collaborations in global analyses of deep-inelastic and related data, including new structure function measurements. We discuss the information that is at present available on the flavour asymmetry of the sea quark distributions of the proton and, in particular, describe how well experiments can discriminate between u-bar, d-bar and s-bar. We comment on extrapolations into the small x region that is accessible at HERA (Hadron-Elektron-Ring-Anlage). (author).

6630 Nuclear Physics

Refer also to citation(s) 1652, 2348

2417 (ANL–93/12) **Physics Division annual review, April 1, 1992–March 31, 1993.** Thayer, K.J. (ed.). Argonne National Lab., IL (United States). Aug 1993. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94002497. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the annual review of the Argonne National Laboratory Physics Division for the period April 1, 1992–March 31, 1993. Work on the ATLAS device is covered, as well as work on a number of others in lab, as well as collaborative projects. Heavy ion nuclear physics research looked at quasi-elastic, and deep-inelastic reactions, cluster states, superdeformed nuclei, and nuclear shape effects. There were programs on accelerator mass spectroscopy, and accelerator and linac development. There were efforts in medium energy nuclear physics, weak interactions, theoretical nuclear and atomic physics, and experimental atomic and molecular physics based on accelerators and synchrotron radiation.

2418 (INIS-BR–3174) **Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.** Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

These proceedings present works on experimental nuclear physics, activation analysis, nuclear interactions, neutron physics, nuclear moments, inelastic scattering, lattices and chemical analysis. (L.C.J.A.).

2419 (INIS-mf–13388) **DAE symposium on nuclear physics (held at Bombay during December 26-30, 1991) : Contributed papers. Vol. 34B.** Department of Atomic Energy, Bombay (India). 1991. 568p. (CONF-9112147–: DAE symposium on nuclear physics, Bombay (India), 26-30 Dec 1991). Order Number DE93612972. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2420 (INIS-RU–343) **Nuclear-physical researches (Theory and experiment).** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i; AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. 1991. 80p. (In Russian). Order Number DE93626131. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2421 (INIS-SU–341/A) **Nuclear and physical investigations.** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). 1990. 96p. (In Russian). Order Number DE93620974. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2422 (JINR–1-47-91) **JINR rapid communications.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 69p. Order Number DE93616535. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2423 (JINR–5-51-91) **JINR rapid communications.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 64p. Order Number DE93626358. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2424 (JINR–7-46-90) **JINR rapid communications.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. 77p. (In Russian). Order Number DE93609511. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

6631 Nuclear Structure

Refer also to citation(s) 2157, 2304, 2453, 2456

2425 (CONF-9210121–8) **High-spin nuclear structure studies with radioactive ion beams.** Baktash, C. Oak Ridge National Lab., TN (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Workshop on the production and use of intense radioactive ion beams for the IsoSpin Laboratory; Oak Ridge, TN (United States); 7-10 Oct 1992. Order Number DE94002452. Source: OSTI; NTIS; INIS; GPO Dep.

Two important developments in the sixties, namely the advent of heavy-ion accelerators and fabrication of Ge detectors, opened the way for the experimental studies of nuclear properties at high angular momentum. Addition of a new degree of freedom, namely spin, made it possible to observe such fascinating phenomena as occurrences and coexistence of a variety of novel shapes, rise, fall and occasionally rebirth of nuclear collectivity, and disappearance of pairing correlations. Today, with the promise of development of radioactive ion beams (RIB) and construction of the third-generation Ge-detection systems (GAMMASPHERE and EUROBALL), the authors are poised to explore new and equally fascinating phenomena that have been hitherto inaccessible. With the addition of yet another dimension, namely the isospin, they will be able to observe and verify predictions for exotic shapes as varied as rigid triaxiality, hyperdeformation and triaxial octupole shapes, or to investigate the T = 0 pairing correlations. In this paper, they shall review, separately for neutron-deficient and neutron-rich nuclei, these and a few other new high-spin physics

opportunities that may be realized with RIB. Following this discussion, they shall present a list of the beam species, intensities and energies that are needed to fulfill these goals. The paper will conclude with a description of the experimental techniques and instrumentations that are required for these studies.

2426 (INIS-UA–0001, pp. 85-91) **Spectroscopic factors of multi neutrons in nuclei.** Kurgalin, S.D. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Chuvil'skij, Yu.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. iNR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceeding of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical weights of the virtual multi neutron channels in nuclei of different mass are studied. The characteristic scale of magnitudes of the spectroscopic factors S_{xn} proved to be the same as for the clusters of the same mass with N≈Z.

2427 (INIS-UA–0001, pp. 140-150) **On the consistency between macroscopic and macroscopic parts in the Shell correction calculation of the polarized electric dipole.** Denisov, V.Yu. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The consistency condition for the proton and neutron radii in the shell correction calculation of the polarized electric dipole moment (PEDM) in the nuclei with octupole deformation is considered. The correct shell correction calculation of the PEDM is presented.

2428 (INIS-UA–0001, pp. 250-259) **Experimental approach to explosive nucleosynthesis in the Universe.** Kubono, S. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

Recent development of experimental studies on explosive nucleosynthesis, especially the rapid proton process and the primordial nucleosynthesis were discussed with a stress on unstable nuclei. New development in the experimental methods for the nuclear astrophysics is also discussed which use unstable nuclear beams.

2429 (INS–983) **Green's function method for pionic decay of hypernuclei: Its application to $_{\Lambda}{}^{5}$He.** Kumagai, Izumi (Hokkaido Univ., Sapporo (Japan). Dept. of Physics): Akaishi, Yoshinori. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1993. 22p. Order Number DE94718991. Source: OSTI; NTIS; INIS.

Green's function method is introduced to treat the weak decay of Λ hypernuclei. The method is applied to the pionic decay spectrum of $_{\Lambda}{}^{5}$He which is of continuum due to three-body final states. Two types of α-Λ potentials are used. One is a potential with central repulsion, called Isle, and the other is a single Gaussian (SG) potential. The obtained decay rate is 0.34 Γ_{Λ} for Isle and 0.26 Γ_{Λ} for SG, Γ_{Λ} being the decay rate of a free Λ particle. The former is in better agreement than the latter with the experimental value 0.44 ± 0.11 Γ_{Λ}. This result suggests that the α-Λ potential has a repulsive part around the center, which would affect structures of some light Λ hypernuclei. (author).

2430 (INS–985) **Nonlinear resonance in the TDHF-manifold.** Sakata, F.; Kubo, T.; Iwasawa, K.; Marumori, T.; Hashimoto, Y. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1993. 21p. Order Number DE94718990. Source: OSTI; NTIS; INIS.

In order to study various aspects of nuclear dynamics within the mean-field theory, it is decisive to develop a general method which is capable of exploring a complicated structure of the time-dependent Hartree-Fock (TDHF)-manifold. The central problem in this objective is how to obtain local approximate invariants characterizing individual TDHF-closed trajectories. Using the Lie canonical transformation method with the Deprit perturbation treatment, the maximal integrable form representation of the TDHF-manifold is proposed. This representation is quite useful to explore the resonant structure of the TDHF-manifold, which characterizes complex topology of the manifold. With the aid of this representation, it is clarified that an isolated nonlinear resonant point of the TDHF-manifold is characterized by a local constant of motion (dynamical symmetry) and generates a pair of stable and unstable resonant mean-fields which are not reached by the conventional static Hartree-Fock nor constrained Hartree-Fock theories. (author).

2431 (INS–986) **Formation of a Ξ-hypernucleus and transitions to double-Λ states.** Ikeda, Kiyomi (Niigata Univ. (Japan). Dept. of Physics); Takahashi, Miho; Fukuda, Tomokazu; Motoba, Toshio; Yamamoto, Yasuo. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1993. 13p. Order Number DE94718989. Source: OSTI; NTIS; INIS.

A scenario is given for the formation of Ξ^- states and the transitions to states with double-Λ in anticipation of observations, especially in the KEK-E224 experiment. First, the production cross sections of Ξ^- hypernuclear states by (K^-, K^+) reactions are calculated within the framework of the distorted-wave impulse approximation. Next, the transition rates from Ξ^- hypernuclear states to possible double-Λ states are obtained, which are closely related to single- and double-Λ emissions after the $\Xi^-p \rightarrow \Lambda\Lambda$ conversion in nuclei. (author).

2432 (JINR-E–2-93-41) **A microscopic description of the neutron-rich lithium isotopes.** Burov, V.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Deripaska, O.V.; Kamchatnova, V.Y.; Shitikova, K.V.; Rzjanin, M.V.; Yen, G.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 14p. Order Number DE94606503. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Phys., G Nucl. Part. Phys.

A unified calculation of neutron-rich isotopes of lithium has been performed in a hyperspherical basis in which the underlying symmetry of each isotope exhibits a simple structure. The variation in the binding energy as a function of mass number is qualitatively reproduced, and the radial distribution of each isotope decreases exponentially asymptotically. It is shown that the form factors for isotopes of ^{6,7}Li well agree with the experimental data at small momenta transfer. 23 refs.; 6 figs.; 4 tabs.

2433 (JINR-R–4-93-148) **Anharmonic gamma vibrations in a simple model.** Marshalek, E.R. (Notre Dame Univ., IN (United States)); Nazmitdinov, R.G.; Ragnarsson, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 10p. (In Russian). Order Number DE94606533. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Organizing Committee of the 43-rd Intern. Conference on Nuclear Spectroscopy and Atomic Nucleus Structure, Dubna, April 1993, and Submitted to Izv. Akad. Nauk SSSR, Ser. Fiz.

Based on a self-consistent harmonic oscillator model rotating around a near-symmetry axis the quadrupole vibrational spectrum is investigated in a deformed system. It is shown the γ-deformation is induced by gamma vibration for one-phonon state in deformed nuclei. 20 refs.; 5 figs.

2434 (LA-UR–93-2928) **New results on multiple excitations of giant resonances.** Mordechai, S. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Physics); Moore, C.F. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States); United States-Israel Binational Science Foundation, Jerusalem (Israel); Welch (Robert A.) Foundation, Houston, TX (United States). DOE Contract W-7405-ENG-36. (CONF-930867–1: Gull Lake nuclear physics conference on giant resonances, Gull Lake, MI (United States), 17-21 Aug 1993). Order Number DE93040099. Source: OSTI; NTIS; INIS; GPO Dep.

Exotic excitations like the double giant dipole were predicted for many years but not observed experimentally until recently. Several experiments have been carried out at Los Alamos National laboratory to search for these new collective modes of the nucleus. The results discover two previously unobserved types of double giant resonances. This work presents the recent pion double charge exchange data and the analysis that support the existence of two such exotic vibrational nuclear modes.

2435 (LA-UR–93-3377) **Nuclear aspects of few-baryon systems.** Gibson, B.F. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308164–3: 14. European conference on few-body problems in physics, Amsterdam (Netherlands), 22-27 Aug 1993). Order Number DE94000766. Source: OSTI; NTIS; INIS; GPO Dep.

Recent progress in understanding the bound state properties of the trinucleons and the alpha particle in terms of a hadron picture of the nucleus is reviewed. The role of three-body forces and meson exchange currents is examined. novel aspects of few-body hypernuclei as well as unresolved issues in this S ≠ O sector are summarized.

2436 (LA-UR–93-3378) **Monte Carlo studies of light nuclei: Structure and response.** Carlson, J. (Los Alamos National Lab., NM (United States)); Schiavilla, R. Los Alamos National Lab., NM (United States). 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308164–4: 14. European conference on few-body problems in physics, Amsterdam (Netherlands), 22-27 Aug 1993). Order Number DE94000765. Source: OSTI; NTIS; GPO Dep.

Monte Carlo methods based upon Euclidean path integrals can be used to study both structure and dynamics in few-body nuclei. Traditionally, these methods have been used in the limit of long imaginary time to extract information about low-lying states of light nuclei. Much intriguing dynamics, though, is present in the short time propagators. We briefly review some nuclear structure results, including bound-state results for A=4 and low-energy scattering for A=5. We stress recent developments related to inclusive processes, in particular calculations of the longitudinal and transverse response functions measured in electron scattering experiments. Calculations performed during the last year offer a much clearer picture of nuclear dynamics. In particular, they reproduce the observed quenching in the longitudinal to transverse response ratio, and the relative shift of strength to higher energies between the isoscalar and isovector responses probed in hadronic reactions.

2437 (LA-UR–93-3490) **Applications of a global nuclear-structure model to studies of the heaviest elements.** Moeller, P.; Nix, J.R. Los Alamos National Lab., NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930905–7: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993). Order Number DE94000674. Source: OSTI; NTIS; INIS; GPO Dep.

We present some new results on heavy-element nuclear-structure properties calculated on the basis of the finite-range droplet model and folded-Yukawa single-particle potential. Specifically, we discuss calculations of nuclear ground-state masses and microscopic corrections, α-decay properties, β-decay properties, fission potential-energy surfaces, and spontaneous-fission half-lives. These results, obtained in a global nuclear-structure approach, are particularly reliable for describing the stability properties of the heaviest elements.

2438 (RAL–93-025, pp. 213-250) **The physics of structure.** Close, F.E. (Rutherford Appleton Lab., Chilton (United Kingdom)). Rutherford Appleton Lab., Chilton (United Kingdom). Apr 1993. (CONF-9209388–: School for young high energy physicists, Abingdon (United Kingdom), 6 Sep 1992). In *Proceedings of the school for young high energy physicists.* 250p. Order Number DE94602554. Source: OSTI; NTIS (US Sales Only); INIS.

This article, delivered at the 1992 School for Graduate High Energy Physicists, held in Abingdon, United Kingdom, looks at the physics of structure. Hadrons are thought to have internal structure because of the spectra from states with large spin J. This shows decay into lighter states with low J, like the excitation spectra of molecules or atoms. Highly inelastic scattering also suggests the presence of underlying constituents. Similarly the inelastic scattering of leptons from protons and neutrons show that they contain point-like fermions with fractional charges, known as quarks. The lecture concentrates on the spectra and how they reveal details of the mechanisms of quantum chromodynamics. (UK).

2439 (RAL–93-040) **Consistent analysis of the spin content of the nucleon.** Close, F.E.; Roberts, R.G. Rutherford Appleton Lab., Chilton (United Kingdom). Jun 1993. 13p. Order Number DE94606504. Source: OSTI; NTIS (US Sales Only); INIS.

The recent measurement of lepton nucleon scattering with polarised neutron and deuteron targets are analysed together with the previous polarised proton data in a mutually consistent way. The detailed α-dependence of the polarisation asymmetry in the valence region is shown to be in agreement with historical predictions based on quark models. The Bjorken sum rule is shown to be confirmed at the 1σ level and estimates of the spin content of the nucleon Δq are extracted. While the average value of Δq from the three experiments comes out to be 0.41 ± 0.05 (to be compared with the naive quark model theoretical expectation of 0.58) this experimental average value is more than one standard deviation from the value obtained from any individual experiment. This inconsistency can be overcome by allowing arbitrary higher twist contributions but the resulting precision is poor, $\Delta q = 0.38 \pm 0.48$. (author).

6632 Radioactivity and Electromagnetic Transitions (Excluding Fission)

Refer also to citation(s) 2504

2440 (CONF-930761–1) **First results of a search for double beta decay of ^{100}Mo with the NEMO 2 detector.** NEMO Collaboration. Mount Holyoke Coll., South Hadley, MA (United States). 15 Jun 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER40553. From International Europhysics conference on high-energy physics; Marseille (France); 22-28 Jul 1993. Order Number DE93040024. Source: OSTI; NTIS; INIS; GPO Dep.

Double beta decay of ^{100}Mo (172g) is studied with the NEMO 2 detector in the Frejus Underground Laboratory. The experiment has now accumulated 2485 hours of data taking. A clear signal of 380 events for $2\beta2\nu$ decay has been obtained corresponding to a half-life of $T_{\frac{1}{2}} = 1.0 \pm 0.08$ (syst.) 10^{19} y. Limits are presented for $2\beta(0\nu, \chi)$, $2\beta0\nu$ (ground state and excited states 2_1^+ and 0_1^+). The experiment will run til October 1993.

2441 (INIS-BR–3174, pp. 29-41) **γ-γ directional angular correlations measurements for transitions in ^{140}Ce.** Zamboni, C.B.; Lapolli, A.L.; Silva Figueira, M.C. da; Yoneama, M.L.; Dias, J.F.; Medeiros, J.A.G. de. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

The directional correlations of coincident gamma transitions have been measured in ^{140}Ce following the β^- decay of ^{140}La, with $T_{1/2}$ = 40,3 hs, using a spectrometer consisting of two Ge detectors. The measurements were carried out for 8 gamma cascades and the multipole mixing ratios, δ, for the majority gamma transitions were extracted from the present results. (author).

2442 (INIS-BR–3174, pp. 42-66) **Measurement of the magnetic hyperfine field at the ^{181}Ta site in nickel matrix.** Saxena, R.N.; Carbonari, A.W.; Pendl Junior, W.; Attili, R.N.; Kenchian, G.; Soares, J.C.A.C.R.; Moreno, M.S. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

The hyperfine magnetic field on the Ta^{181} nucleus were determined using the gamma-gamma perturbed angular correlation

method, on a nickel matrix, with a 133-482 KeV cascade from the Hf-^{181} beta minus decay. (L.C.J.A.).

2443 (JINR-E–4-92-183) **The nonadiabatic behaviour of E2($\gamma\rightarrow$gr) transitions in ^{166}Er.** Nesterenko, V.O. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Usmanov, Ph.N.; Okhunov, A.A.; Fahlander, C. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 11p. Order Number DE94606545. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to J. Phys., G.

The nonadiabatic behaviour of E2($\gamma\rightarrow$gr) transitions in ^{166}Er is discussed and the influence on this behaviour of the Coriolis mixing between ground and γ bands through the 1^+ states including the low-energy 'scissors' mode is condidered. 17 refs.; 4 figs.; 2 tabs.

2444 (LAL–93-02) **Research of the double beta decay.** Campagne, J.E. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Jan 1993. 61p. (In French). (CONF-9209391–: Gif school, Gif-sur-Yvette (France), 14 Sep 1992). Order Number DE94604896. Source: OSTI; NTIS (US Sales Only); INIS.

In this report, the author gives the theoretical elements that are necessary for the research of double beta decay with or not neutrino emission and for the definition of effective neutrino mass, presents the theoretical and experimental difficulties and discusses the last experimental results.

6633 Nuclear Reactions and Scattering, General

Refer also to citation(s) 2557

2445 (INIS-UA–0001, pp. 54-62) **Time evolution of the nuclear reaction process.** Bunakov, V.E. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The present talk is a brief summary of our investigations. The estimate the validity of statistical master equation approach to the description nucleon-nucleus reactions plus some comments on heavy-ion reaction kinetics and on exotic nuclei production are presented.

2446 (INIS-UA–0001, pp. 75-84) **The radioactive ion beam project at Louvain-la-Neuve: a status report.** Wouters, J. (Louvain Univ., Louvain-la-Neuve (Belgium). Unite de Physique Nucleaire); Debbar, Th.; Galster, W.; Leleux, P.; Licot, I.; Lienard, E.; Lipnik, P.; Loiselet, M.; Michotte, C.; Ryckewaert, G.; Vervier, J.; Decrock, P.; Huyse, M.; Vanderpoorten,.AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

In Louvain-la-Neuve a pioneering project has recently been started to produce intense radioactive ion beams (RIB) by using a two-accelerator concept. The facility is already operational and first astrophysical experiments have been carried out with intense ^{13} N beam. The production and use of the ^{13} N beam is discussed. In a first experiment, the ^{13} N $(p,\gamma)^{14}$ O reaction cross section has been determined. Also first test experiments using polarization of these radioactive ion beams are reported.

2447 (INIS-UA–0001, pp. 164-168) **Spin dependence of nuclear reaction cross-sections.** Gopych, P.M. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Sorokin, V.I.; Sotnikov, V.V.; Zalyubovskij, I.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of regular spin splitting of nuclear reaction cross-sections can be observed: (1) for different reactions; (2) for different energies of incident particles; (3) for target nuclei of different atomic number. All this allows to conclude that this effect is mainly stipulated by characteristics of product nuclei of the reactions and therefore it can probably be observed for wider range of reactions and energies of incident particles.

2448 (INIS-UA–0001, pp. 184-200) **Light particle emission in dissipative collisions.** Aleshin, V.P. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

A semiclassical description is presented for light particle emission from composite systems with a time-dependent shape. With nuclear shapes as a function of time taken from the Feldmeier one-body dissipation code we calculate the multiplicities of light particles accompanying fission for intermediate systems with A=150-160 having excitation energies of 100 to 300 MeV. The calculations are consistent with experimental data for neutrons. For a good description of the charged particle multiplicities, one has to assume that particle separation energies reflect the structure of two nuclei making the composite system rather than that mono nucleus.

2449 (INIS-UA–0001, pp. 201-206) **Quasifree scattering of the loosely bound nucleons in the radioactive beam experiments.** Zagrebaev, V. (Chuvashskij Gosudarstvennyj Univ., Cheboksary (Russian Federation)). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school of nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

An alternative mechanism of neutron formation is considered: 'shaking off' the loosely bound nucleon from from the projectile with its subsequent scattering on a target. The collision may be the central one and the projectile's core may simply fuse with the target nucleus (at low and medium energies) and will be not detected in exit channel. All outermost nucleons of the projectile (e.g., 4 for ^{8} He)may participate in such the process. In this case their strong focusing occurs behind the target nucleus and the high-density neutron matter is formed.

2450 (INIS-UA–0001, pp. 207-227) **Effective potential for describing of elastic scattering of weakly coupled particles by heavy nuclei.** Il'in, A.P. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The adiabatic model of the interaction of a composed particle with a heavy nucleus is formulated on the basis of the exact solution of the two Coulomb centre problem. It is studied the eigen functions' system of the adiabatic Hamiltonian which describes the interaction between two clusters forming the particle when the last one is scattered by the nucleus at the value of energy not much above the Coulomb barrier. The eigen states of this Hamiltonian are found to be quite analogous to the vectors of the rigged Hilbert space and fulfill the relations of bi orthogonality and completeness. Using the wave functions of that eigen states the nonlocal potential of the effective interaction of a weakly coupled particle with a heavy nucleus is constructed on the basis of the method of coupled adiabatic channels. One practically important example is considered with linear approximation for polarizing potential.

2451 (INIS-UA–0001, pp. 228-230) **Electric optical potential for weakly-bound particles.** Terentskij, K.O. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Verbitskij, V.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

Internal weakly-bound particle wave function and electric optical potential for this particles has been calculated in adiabatic approximation. Calculations have been fulfilled without the Coulomb potential multipole decomposition compared with dipole approximation ones.

2452 (INIS-UA–0001, pp. 275-279) **The (^{3} He, α) reaction on 1 p-shell nuclei and antisymmetrization effects.** Bekbaev, S.M. (AN Uzbekskoj SSR, Tashkent (Uzbekistan). Inst. Yadernoj Fiziki); Gulamov, I.R.; Kim, G.; Mukhamedzhanov, A.M.; Nie, G.K. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The calculations of the A(^{3} He, α)B reaction have been carried out in the framework of DWBA with l-splitted optical potentials, the exchange processes being taken into account phenomenologically. It was shown that a contribution of the exchange process is of particular value.

2453 (JINR-E–15-93-96) **High-spin nuclear target of $^{178m}_2$Hf: creation and nuclear reaction studies.** Oganessyan, Yu.Ts. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Karamyan, S.A.; Gangrskij, Yu.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. 20p. Order Number DE94606549. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Proceedings of the Intern. Conference 'Nuclear Physics of Our Times', Florida, USA, November, 1992.

A long-lived (31 years) four-quasiparticle isomer $^{178m}_2$Hf(I,K$^\pi$=16,16$^+$) was produced in microweight quantities using the nuclear reaction ^{176}Yb(^{4}He, 2n). Methods of precision chemistry and mass-separation for the purification of the produced Hf material have been developed. Thin targets of isomeric hafnium-178 on carbon backings were prepared and used in experiments on a neutron, proton and deuteron beams. First results on nuclear reactions on a high-spin exotic target were obtained. Experiments on electromagnetic interactions of the isomeric hafnium using methods of the collinear laser spectroscopy as well as of the nuclear orientation of hafnium implanted into a crystalline media were started. 11 refs.; 11 figs.; 2 tabs.

6634 Specific Nuclear Reactions and Scattering

Refer also to citation(s) 491, 732, 1286, 2299, 2327, 2367, 2373, 2374, 2380, 2404, 2434, 2436, 2794, 2800, 2814

2454 (ANL/PHY/CP–79186) **Measurement of the asymmetry in $^3\vec{H}e(\vec{e},e')$ quasielastic scattering.** Jones, C.E. (Argonne National Lab., IL (United States)). Argonne National Lab., IL (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38 ;AC02-76ER03069. Grant PHY91-15574;Grant PHY92-08119. (CONF-930637–4: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94000469. Source: OSTI; NTIS; INIS; GPO Dep.

A measurement of the helicity-dependent asymmetry in $^3\vec{H}e(\vec{e},e')$ quasielastic scattering at $Q^2 \sim 0.16 - 0.2$ (GeV/c)^2 using 370 MeV electrons was recently completed at the Bates Linear Accelerator Center. Asymmetries sensitive to both spin-dependent quasielastic response functions were measured. The results improve on previous measurements with polarized ^{3}He targets in both statistical and systematic precision.

2455 (ANL/PHY/CP–80692) **Deuteron photodisintegration: Data and plans.** Napolitano, J. (Rensselaer Polytechnic Inst., Troy, NY (United States). Dept. of Physics); Anthony, P.; Arnold, R. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant PHY-9208119. (CONF-9306260–1: Conference on exclusive reactions at high momentum transfer, Elba (Italy), 24-26 Jun 1993). Order Number DE93041170. Source: OSTI; NTIS; INIS; GPO Dep.

We review existing data for the exclusive reaction $\gamma d \rightarrow pn$ at photon energies above $\approx$ 1 GeV. We compare these data to various models, most notably those which rely on fundamental quark and gluon degrees of freedom. We include a discussion of future plans for related measurements.

2456 (ANL/PHY/CP–80848) **Proton inelastic scattering on ^{56}Ni in inverse kinematics.** Kraus, G. (GSI, Darmstadt (Germany)); Egelhof, P.; Fischer, C.; Geissel, H.; Himmler, A.; Nickel, F.; Muenzenberg, G.; Schwab, W.; Weiss, A.; Chulkov, L.; Golovkov, M.; Ogloblin, A.; Friese, J.; Gillitzer, A.; Koerner, H.J.; Peter, M.; Henning, W.; SchiffeArgonne National Lab., IL (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9305291–1: 3. international conference on radioactive nuclear beams, Upton, NY (United States), 24-27 May 1993). Order Number DE94001434. Source: OSTI; NTIS; INIS; GPO Dep.

Inelastic proton scattering to the first excited 2$^+$ state at 2.701 MeV in doubly magic ^{56}Ni was studied at 101 MeV/u in inverse kinematics. The radioactive ^{56}Ni ion beam was obtained from the SIS heavy ion synchrotron at GSI Darmstadt via fragmentation of a ^{58}Ni beam, and separation by the fragment separator (FRS). A value B(E2, 0$^+ \rightarrow$ 2$^+$) = 600 $\pm$ 120 e^2 fm^4 was obtained which corresponds to a deformation parameter β (^{56}Ni) = 0.173 $\pm$ 0.017.

2457 (ANL/PHY/CP–81005) **Electron scattering from polarized tritium.** Jones, C.E. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9307145–2: Workshop on electron nucleus scattering, Elba (Italy), 5-10 Jul 1993). Order Number DE94002162. Source: OSTI; NTIS; INIS; GPO Dep.

the recent development of high-intensity gaseous targets of polarized hydrogen and deuterium raises the interesting possibility of developing a polarized tritium target that can operate in relatively high current electron beams. Here I discuss the feasibility of a measurement of the helicity-dependent asymmetry in $^3\vec{H}(\vec{e},e')$ inclusive quasielastic scattering with such a target.

2458 (BNL–49498) **Distributions of transverse energy, protons and mesons from Au+Au collisions at 11.6A GeV/c.** Moskowitz, B.; Gonin, M. Brookhaven National Lab., Upton, NY (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930637–10: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94001383. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results of measurements of distributions of transverse energy, protons and charged mesons from Au+Au at 11.6A GeV/c are presented and compared to corresponding results from Si+A.

2459 (BNL–49499) **Strange cluster formation in relativistic heavy ion collisions.** Baltz, A.J. (Brookhaven National Lab., Upton, NY (United States)); Dover, C.B.; Kahana, S.H.; Pang, Y.; Schlagel, T.J.; Schnedermann, E. Brookhaven National Lab., Upton, NY (United States); State Univ. of New York, Stony Brook, NY (United States). Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ;FG02-93ER40768. (CONF-930637–6: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94001490. Source: OSTI; NTIS; INIS; GPO Dep.

Using the cascade code ARC to simulate relativistic heavy ion collisions at Brookhaven AGS energies (11.7–14.6 GeV/c), the authors have estimated the production rate of strange clusters ranging from a hypothetical doubly strange (S=−2) bound $(\Lambda\Lambda)_b$ dibaryon to the hypernuclei ${}_{\Lambda\Lambda}{}^{6}$He and ${}_{\Xi^0\Lambda\Lambda}{}^{7}$He. For the formation of multi-strange bound systems, high energy heavy ion collisions offer the only feasible method, since one can take advantage of the hyperons which are copiously produced in such collisions (typically 20 Λ's in a Au + Au central collision at the AGS) to form the composite object by coalescence.

2460 (BNL–49548) **Systematics of hadronic production from Si and Pb with 14.6 × A GeV/c Si beams.** Saulys, A.C. E810 Collaboration. Brookhaven National Lab., Upton, NY (United States). 20 Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ;FG02-91ER40645 ;FG02-88ER40413 ;FG05-87ER40309. (CONF-930637–9: 13. international conference on particles and nuclei, Perugia (Italy), 27 Jun - 3 jul 1993). Order Number DE94001900. Source: OSTI; NTIS; INIS; GPO Dep.

The differential cross sections for production of K_s^0's, Λ's and π^-'s from Si and Pb targets using 14.6 × A GeV/c Si beams at the AGS are presented as a function of rapidity and transverse mass. These results are compared with model predictions and K_s^0 production is compared with π^- production.

2461 (CONF-930169–4) **Light particles emitted in coincidence with evaporation residues in ^{79}Br(930 MeV) + ^{27}Al collisions.** Chavez Lomeli, E. (Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Inst. de Fisica); Dacal, A.; Ortiz, M.E.; D'Onofrio, A.; Gomez del Campo, J.; Kim, H.; Korolija, M.; Shapira, D. Oak Ridge National Lab., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 16. nuclear physics symposium; Oaxtepec (Mexico); 5-8 Jan 1993. Order Number DE94000495. Source: OSTI; NTIS; INIS; GPO Dep.

Exclusive measurements of light particles, deuterons, tritons and alphas, in coincidence with Evaporation Residues (ER), were performed at the Holified Heavy Ion Research Facility of the Oak Ridge National Laboratory using the large detector array HILI (Heavy Ion Light Ion). Heavy fragments produced in the reaction (Z 35), were stopped in the Ionisation Chamber, where their energy, atomic number (Z) and position were measured. Coincident light particles, were detected in the 192 element hodoscope placed behind the chamber, where its charge (Z) and energy were measured. Also the time of flight relative to the radio frequency of the cyclotron, allowed identification of protons deuterons and tritons.

2462 (INIS-mf–13731, pp. 10) **Wide angle emission of heavy fragments in relativistic heavy ion collisions and some open problems.** Brandt, R. (Kernchemie, Philipps-Univ., Marburg (Germany)); Heck, M.; Heise, S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209143–: 22. American Society of Mechanical Engineers (ASME) biennial mechanisms conference, Scottsdale, AZ (United States), Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY ION REACTIONS/nuclear fragments; NUCLEAR FRAGMENTS/angular distribution; BUBBLE CHAMBERS; DIELECTRIC TRACK DETECTORS; MEAN FREE PATH; RELATIVISTIC RANGE

2463 (INIS-mf–13731, pp. 13) **Anomalous anisotropies of fission fragments in near- and sub-barrier fusion-fission reactors.** Zhang Huanqiao (Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy); Liu Zuhua; Xu Jinchen; Lu Jun; Ruan Ming; Xu Kan. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION FRAGMENTS/anisotropy; FISSION FRAGMENTS/dielectric track detectors; HEAVY ION FUSION REACTIONS/fission fragments; ANGULAR DISTRIBUTION; COUPLED CHANNEL THEORY; CROSS SECTIONS; EXCITATION FUNCTIONS; FISSION; FISSION BARRIER; ANISOTROPY; MICA

2464 (INIS-mf–13731, pp. 27) **The use of CR-39 plastic detectors for investigation of elastic scattering of exotic nuclei.** Tretyakova, S.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Golovchenko, A.; Lukyanov, S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELASTIC SCATTERING/dielectric track detectors; ELASTIC SCATTERING/neutron-rich isotopes; CARBON; CROSS SECTIONS; HELIUM IONS; LEAD; LIGHT NUCLEI; LITHIUM IONS; SILICON; SILVER

2465 (INIS-mf–13731, pp. 28) **Study of high energy heavy fragments from the interaction of 3.65 A GeV ^{19}F or ^{16}O with Cu.** Cui Huanhua (Academia Sinica, Beijing, BJ (China). Inst. of High Energy Physics). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/nuclear fragments; FLUORINE 19 REACTIONS/copper; FLUORINE 19 REACTIONS/nuclear fragments; OXYGEN 16 REACTIONS/copper; OXYGEN 16 REACTIONS/nuclear fragments; ANGULAR DISTRIBUTION; CALIBRATION; DIMENSIONS; DISTANCE; FISSION TRACKS; COPPER

2466 (INIS-mf–13731, pp. 31) **Semi-kinematical analysis of 3- and 4-pronged events of the U + Ag reaction at 15 MeV/n.** Zamani, M. (Univ. of Thessaloniki (Greece)); Debeauvais, M.; Ralarosy, J.; Fernandez, F.; Jokic, S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEEP INELASTIC HEAVY ION REACTIONS/particle kinematics; SILVER/deep inelastic heavy ion reactions; URANIUM/deep inelastic heavy ion reactions; DIELECTRIC TRACK DETECTORS; MASS; NUCLEAR FRAGMENTS; QUATERNARY FISSION; SILVER; TERNARY FISSION; URANIUM; VELOCITY

2467 (INIS-mf–13731, pp. 54) **Target fragmentation in 3.65 A GeV ^{12}C + ^{208}Pb reaction.** Grabez, B. (Belgrade Univ. (Yugoslavia). Inst. za Fiziku). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 208 TARGET/carbon 12 reactions; LEAD 208 TARGET/nuclear fragments; ANGULAR DISTRIBUTION; CORRELATIONS; DIELECTRIC TRACK DETECTORS; ELECTRIC CHARGES; MULTIPLICITY

2468 (INIS-mf–13731, pp. 55) **Study of complex particle emission in alpha induced reactions on aluminium.** Mukherjee, R.N. (Saha Inst. of Nuclear Physics, Calcutta (India)); De, T.K.; Baliga, B.B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALUMINIUM/alpha reactions; ALUMINIUM/emission spectra; ALUMINIUM; ANGULAR DISTRIBUTION; DIELECTRIC TRACK DETECTORS; DIFFERENTIAL CROSS SECTIONS; MEV RANGE 10-100; NUCLEAR FRAGMENTS

2469 (INIS-mf–13731, pp. 57-58) **The mean free path of alpha projectile fragment from ^{16}O-Em at 60 A GeV.** Zhang, D.H. (Shanxi Normal Univ., Linfen (China)). EMU01 collaborated. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA PARTICLES/mean free path; ALPHA PARTICLES/nuclear fragments; OXYGEN 16/nuclear emulsions; OXYGEN 16/nuclear fragments; COLLISIONS; GEV RANGE 100-1000

2470 (INIS-mf–13731, pp. 60) **Heavy ion reaction systematics observed with SSNTDS.** Qureshi, I.E. (NPD-PINSTECH, Islamabad (Pakistan)); Manzoor, S.; Khan, H.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY ION REACTIONS/dielectric track detectors; COMPUTER CALCULATIONS; CROSS SECTIONS; ENERGY DEPENDENCE; NUCLEAR REACTION KINETICS

2471 (INIS-mf–13731, pp. 154) **Interaction of ^{16}O and ^{19}F ions with thick copper target at relativistic energies.** Shahzad, M.I. (Computer Division, PINSTECH, Islamabad (Pakistan)); Manzoor, S.; Khan, H.A.; Qureshi, I.E.; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/ion-atom collisions; ION-ATOM COLLISIONS/copper; ION-ATOM COLLISIONS/oxygen 16 beams; CALIBRATION; ETCHING; FLUORINE 19 BEAMS; GEV RANGE 10-100; IMAGE PROCESSING; COPPER; PARTICLE TRACKS

2472 (INIS-mf–13731, pp. 155) **Interaction of 15.9 MeV/u ^{197}Au ions with ^{nat}Au and ^{209}Bi as targets on CR-39 plastic track detectors.** Manzoor, S. (SSNTD-Lab., NED, PINSTECH, Islamabad (Pakistan)); Chaudhary, U.K.; Khan, H.A.; Khalid, A.; Qureshi, I.E.; Shahzad, M.I. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH 209 TARGET/gold 197 reactions; DIELECTRIC TRACK DETECTORS/ion-atom collisions; ION-ATOM COLLISIONS/gold 197 beams; CROSS SECTIONS; ELASTIC SCATTERING; GEV RANGE 01-10; GOLD; INELASTIC SCATTERING; ORGANIC POLYMERS

2473 (INIS-mf–13731, pp. 268) **Recombination of quarks and antiquarks for multiparticle production in high energy nuclear interactions.** Sharma, A.P. (Dept. of Physics, Aligarh Muslim Univ. (India)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUARK-ANTIQUARK INTERACTIONS/multiple production; NUCLEAR EMULSIONS; PION MINUS-NEUTRON INTERACTIONS; PION MINUS-PROTON INTERACTIONS; TRANSVERSE MOMENTUM

2474 (INIS-mf–13731, pp. 270) **Multifragment des integration of ^{209}Bi+Pb(Ag) system AT E/A=11.6 MeV.** Grabez, B. (Institute of Physics, Beograd (Yugoslavia)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH 209 REACTIONS/lead; BISMUTH 209 REACTIONS/silver; LEAD; SILVER; DIELECTRIC TRACK DETECTORS; GEV RANGE 01-10; NUCLEAR FRAGMENTS

2475 (INIS-mf–13731, pp. 271) **Study of multi-prong events in the interaction of 16.7 MeV/u ^{238}U-ions with ^{nat}Au targets using CR-39 and mica track detectors.** Shahzad, M.I. (Computer Division, PINSTECH, Islamabad (Pakistan)); Manzoor, S.; Khan, H.A.; Qureshi, I.E. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM 238 REACTIONS/gold 197 target; COINCIDENCE METHODS; DIELECTRIC TRACK DETECTORS; GEV RANGE 01-10; MICA; PARTICLE TRACKS; TOTAL CROSS SECTIONS

2476 (INIS-mf–13731, pp. 273) **Fusion-fission of ^{238}U and ^{209}Bi in different SSNTDs.** Raju, J. (Dept. of Chemistry, North-Eastern Hill Univ. (India)); Dwivedi, K.K. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH 209/fission; BISMUTH 209/heavy ion fusion reactions; URANIUM 238/fission; URANIUM 238/heavy ion fusion reactions; FISSION; COMPOUND NUCLEI; DIELECTRIC TRACK DETECTORS; MATRIX MATERIALS

2477 (INIS-mf–13731, pp. 274) **Observation of multi-prong events in the interaction of 8.5 MeV/u ^{208}Pb with Pb (natural).** Ahmed, M. (National Physical and Standards Lab., Islamabad (Pakistan)); Khan, H.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 208 REACTIONS/lead; LEAD 208 REACTIONS/particle tracks; CROSS SECTIONS; GEV RANGE 01-10; LEAD; MANY-BODY PROBLEM; MICA

2478 (INIS-mf–13731, pp. 275) **Overview of the mass-dependence of pion-induced fission.** Khan, H.A. (Pakistan Inst. of Nuclear Science and Technology, Islamabad (Pakistan)); Khan, N.A.; Peterson, R.J. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PIONS/fission; CROSS SECTIONS; ENERGY DEPENDENCE; IRON; MASS; MEV RANGE 10-100; PIONS; FISSION; URANIUM

2479 (INIS-mf–13731, pp. 276) **Behaviors of 200 AGeV ^{32}S and fragments in collisions with Cu target.** Ren Guoxiao (Inst. of High Energy Physics, Academia Sinica (China)); Jing Guiru. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR FRAGMENTS/copper; SULFUR 32/copper; ANGULAR DISTRIBUTION; COLLISIONS;

CROSS SECTIONS; DIELECTRIC TRACK DETECTORS; MEAN FREE PATH; COPPER; TEV RANGE 01-10

2480 (INIS-mf–13731, pp. 277) **Study on the interaction of 960 A MeV ^{238}U ions with light nuclei.** Cui Huanhua (Inst. of High Energy Physics, Academia Sinica, Beijing (China)); Ke Wei; Zhou Jian; Lu Weichun; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413– : 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM 238 REACTIONS/light nuclei; BINARY FISSION; DIELECTRIC TRACK DETECTORS; GEV RANGE 100-1000; MEAN FREE PATH; MULTIPLICITY; RANGE

2481 (INIS-mf–13731, pp. 278) **Study of heavy ion reaction ^{238}U + ^{nat}U at beam energy of 14.2 MeV/N using mica track detector.** Zhou Peide (China Inst. of Atomic Energy, Beijing (China)); Guo Shilun; Brandt, R.; Vater, P. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413– : 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM 238 REACTIONS/uranium; COLLISIONS; DIELECTRIC TRACK DETECTORS; FISSION; GEV RANGE 01-10; MICA; PARTICLE TRACKS; URANIUM

2482 (INIS-UA–0001) **Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.** Rudchik, A.T. (ed.). AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The proceedings contain lectures and contributed papers submitted to the second INR (Kiev's) International School on Nuclear Physics (Kiev, June 25 -July 2, 1991). The following sections were included in the Proceedings: Radioactive Beam Facilities, Application of Radioactive Beams in the Investigations of Nuclear Reactions, Exotic Nuclei and Clusters, Polarization Phenomena, Astrophysics and Others.

2483 (INIS-UA–0001, pp. 9-20) **Exotic cluster studies with radioactive ion beams.** Rudchik, A.T. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Ziman, V.A.; Chuvil'skij, M.Yu. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The problems of exotic cluster studies for light nuclei are discussed. Some radioactive ion beams for these purposes are proposed.

2484 (INIS-UA–0001, pp. 28-34) **Correlative experiments with radioactive beams.** Pugach, V.M. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Pavlenko, Yu.N.; Kolomiets, I.N.; Vasil'ev, Yu.O.; Kiva, V.A.; Medvedev, V.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility to study neutron nuclei created in direct break-up processes of light neutron rich nuclei by heavy nuclei is discussed herein. From experimental investigations of break-up of lighter isotopes ^{3} He, ^{4} He one may see that such processes have large cross section. Break-up product spectra as well as their angular dependence can be rather good described in framework theory.

2485 (INIS-UA–0001, pp. 231-249) **The production of the neutron-rich heavy nuclei of the astrophysical interest at the IRIS facility.** Bol'shakov, V.A. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki); Dernyatin, A.G.; Mezilev, K.A.; Novikov, Yu.N.; Polyakov, A.G.; Popov, A.V.; Sergeev, Yu.Ya.; Tikhonov, V.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The targets of the Th C_x and U C_x have been used for production of Fr, Ra (Ac) nuclides of the Astrophysical interest at the IRIS mass-separator on-line with the 1 GeV proton synchrocyclotron at LNPI. A fine-grained powder of a target has been prepared using a special technology based on a high temperature destruction of the thermo stable organometallic compounds of U, Th or Cm (diphtalocyanine). The new neutron-rich nuclides have been identified: ^{232} Fr (5±1 s), ^{233} Ra (30±5 s). The yields of some nuclides from Cm C_x-target have been also determined.

2486 (INIS-UA–0001, pp. 260-269) **Diffraction description of particle spectra from transfer reactions at high excitation energies of nuclei.** Evlanov, M.V. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Vasil'ev, Yu.O. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The shape and the magnitude of outgoing particle spectra in the high excitation energy region of the final are investigated in the framework of the diffraction theory of the composite ion fragmentation process. The comparison of the theory with the experimental spectra for the case of transfer reactions induced by both light and heavy ions is made.

2487 (INIS-UA–0001, pp. 270-274) **Vertex constant and spectroscopic factors from analysis of (^{3} He,d) reactors on ^{9} Be, ^{11} B and ^{12} C nuclei.** Artemov, S.V. (AN Uzbekskoj SSR, Tashkent (Uzbekistan). Inst. Yadernoj Fiziki); Gulamov, I.R.; Karakhodzhaev, A.A.; Mukhamedzhanov, A.M.; Nie, G.K.; Yuldashev, I.; Zotov, I.Yu. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The work presented continues studies of the one-nucleon transfer reactions (p,d), (d,t) and (^{3} He, α) by using a new combined method which consists in introducing a nucleon vertex constant (VC) into the framework of DWBA. The differential cross sections of the A(^{3} He, d)B proton transfer reaction on the 1 p-shell nuclei has been measured. It is expected to be a peripheral process.

2488 (INIS-UA–0001, pp. 280-286) **The method for investigation of unbound states of radioactive nuclei.** Pugach, V.M. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Pavlenko, Yu.N.; Kolomiets, I.N.; Kiva, V.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The coincidences between two α-particles from reactions ^{64} Ni(^{14} N, $\alpha\alpha$)X, ^{124} Sn(^{14} N,$\alpha\alpha$)X at E(^{14} N)=128 MeV were measured. Light particles with small relative momenta were detected by the special two-segment detectors. The experimental two-dimensional α-α coincident spectra were transformed into relative energy spectra of two α-particles. The possibility to extract information about resonance parameters, branching ratios of decay, influence of particle-spectator on observed characteristic of resonance is discussed.

2489 (INIS-UA–0001, pp. 287-298) **Investigation of β-delayed neutron emission and elastic scattering of neutron-rich isotopes of He and Li.** Skobelev, N.K. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Luk'yanov, S.M.; Penionzhkevich, Yu.E.; Sokol, E.A.; Tret'yakova, S.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the works studying the properties of neutron-rich nuclei of the He and Li at secondary beams of a cyclotron of the Laboratory of Nuclear Reactions JINR (accelerator U-400) and set-ups designed are presented. The main components of the set-up are: - magnetic separation channel - system of detectors for nuclear identification and studying of their properties - electronics, maintaining this system of detectors and the set-up.

2490 (INIS-UA–0001, pp. 299-304) **The ^{7}Be yields from α-pickup (^{3}He,^{7}Be) reactions on lig ht nucleus.** Mashkarov, Yu.G. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Koschy, E.I.; Dujsebaev, A.D.; Burtebaev, A.T.; Adodin, V.V.; Goryunov, O.Yu.; Rudchik, A.T.; Glowacka, L. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

The angular distribution of (^{3}He,^{7}Be)-reaction cross-sections were measured on ^{6,7}Li, ^{9}Be, ^{12,13}C, ^{16}O and ^{19}F nuclei at E(^{3}He)=60 MeV. The data were analyzed with exact finite range DWBA theory. The ^{7}Be yields from these reactions were estimated for radioactive beams.

2491 (INIS-UA–0001, pp. 310-316) **Radioactive nuclides from the nuclear reactions of 3.65 A GeV ^{16}O and ^{19}F with ^{181}Ta.** Fedorets, I.D. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Ratkevich, S.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

Charge and mass distributions were determined. The total cross sections for the production of target residues from the nuclear reactions of 3.65 A GeV ^{16}O and ^{19}F with ^{181}Ta indicate that same products result from collisions where the center of the projectile lies inside the radius of the target nucleus, in contract to result obtained with low mass target.

2492 (INIS-UA–0001, pp. 317-322) **Isobaric and mass distribution in the interaction of 3.65 A GeV ^{12}C with yttrium and silver.** Fedorets, I.D. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Ratkevich, S.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij. 1992. 337p. (CONF-9106445–: 2. INR (Kiev's) international school on nuclear physics, Kiev (Ukraine), 25 Jun - 2 jul 1991). In *Radioactive beams and their applications: Proceedings of the second INR (Kiev's) international school on nuclear physics.* Order Number DE94604545. Source: OSTI; NTIS (US Sales Only); INIS.

Isobaric and mass distributions of products from nuclear reactions of 3.65 A GeV ^{12}C ions with ^{89}Y and ^{nat} Ag targets were determined . A 10-parameter equation accurately reproduces the obtained isobaric and mass yield curves. Validity of the concepts of limiting fragmentation and factorization is discussed.

2493 (INS–976) **A naturally occurring trap for antiprotons.** Eades, J. (European Organization for Nuclear Research, Geneva (Switzerland)); Morita, N.; Ito, T.M. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. May 1993. 13p. Order Number DE94718996. Source: OSTI; NTIS; INIS.

The phenomenon of delayed annihilation of antiprotons in helium is the first instance of a naturally occurring trap for antimatter in ordinary matter. Recent studies of this effect at CERN are summarized, and plans are described for laser excitation experiments to test its interpretation in terms of metastable exotic helium atom formation. (author).

2494 (INS–988) **Δ excitation in ^{3}He and ^{4}He by photons.** Maruyama, Koichi. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1993. 19p. Order Number DE94718988. Source: OSTI; NTIS; INIS.

The use of the ^{3}He and ^{4}He photodisintegration reactions in the study of the excitation, propagation, and decay of the Δ (1232) in these nuclei is proposed. By using the data obtained with TAGX for both photon absorption on neutron-proton pairs and complete photodisintegration, we find no compelling evidence for the change of the Δ property in the ^{3}He and ^{4}He nuclei. It is also proposed to use nuclear photodisintegration in the search for the excitation of the higher-mass nucleon resonances whose absence in the total photon-absorption cross sections in nuclei is reported recently. (author).

2495 (JAERI-M–93-124) **Measurement of formation cross sections of short-lived nuclei by 14 MeV neutrons - Ru, Pd, Cd, Sn -.** Kasugai, Yoshimi (Nagoya Univ. (Japan)); Tanaka, Akihiko; Asai, Masato; Yamamoto, Hiroshi; Katoh, Toshio; Kawade, Kiyoshi; Iida, Toshiyuki; Takahashi, Akito. Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 47p. Order Number DE94718958. Source: OSTI; NTIS; INIS.

Eighteen neutron activation for (n,2n), (n,p), (n,n'p) and (n, α) reactions producing short-lived nuclei with half-lives between 21 s and 21 min have been measured in the energy range of 13.4 to 14.9 MeV for Ru, Pd, Cd and Sn. Half-life of ^{105m}Rh, ^{120m1}In and ^{120m2}In produced by 14 MeV neutron bombardments was measured with Ge detectors in the spectrum multi-scaling mode. (author).

2496 (JINR-D–15-92-324) **Investigation of strong interactions at very low energies (50 eV - 1000 eV).** Belyaev, V.B. (and others); Bystritskij, V.M.; Kartavtsev, O.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 8p. Order Number DE94606567. Source: OSTI; NTIS (US Sales Only); INIS.

To study nuclear reactions d+d→t+p, p+^{6}Li→^{7}Be+γ, d+^{3}He→p+^{4}He, etc. at very low energies (50 eV - 1000 eV) by means of liner plasma the experimental programm is proposed. The products of nuclear reactions are proposed to be registered with polymeric track detectors on the basis of CR-39, NaJ(Tl) scintillation detectors, etc. The lower limit of cross sections estimated for dd reaction is $\sigma \simeq 10^{-38}$ cm^{2}. The investigations are proposed to be carried out in the Heavy Current Electronics Institute (Russia, Tomsk). 9 refs.; 1 fig.; 1 tab.

2497 (JINR-E–1-92-256) **Production of hyperfragments by antiprotons at rest annihilating on nuclei in nuclear photoemulsion.** Batusov, Yu.A. (and others); Bunyatov, S.A.; Pontecorvo, G.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 15p. Order Number DE94606568. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

Events have been observed, for the first time, of the production, departure and mesonic decay of the light hyperfragments $_{\Lambda}^{3}$H and $_{\Lambda}^{4}$H in the annihilation on the light (C, N, O, S)-nuclei of antiprotons stopping in nuclear photoemulsion. The lower limit of the production probability of $_{\Lambda}^{3}$H and $_{\Lambda}^{4}$H hyperfragments per single antiproton stopping in nuclear photoemulsion has been determined to be $(6.1 \pm 3.5) \times 10^{-4}$. The charge exchange, on nucleons of the residual nucleus, of K^{-}-mesons resulting from the annihilation process has been demonstrated to be the most probable mechanism of hyperfragment production. 17 refs.; 9 figs.

2498 (JINR-E–1-92-307) **Inclusive neutral pion production at forward angles at 4.5 GeV/c per nucleon in nucleus-nuclei reactions.** Abraamyan, Kh.U. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Izyurov, V.M.; Khachaturyan, M.N.; Kozhin, M.A.; Khudaverdyan, A.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 7p. Order Number DE94606569. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Lett., Sect. B.

Transverse momentum πp, cumulative number X distributions of inclusive neutral pions are measured with a lead glass calorimeter in 4.5 GeV/c per nucleon α+C→π^0+x and α+Cu→π^0+x reactions. The target-mass dependence for π^0 production is presented. 7 refs.; 6 figs.; 3 tabs.

2499 (JINR-E–1-93-51) **Tensor analyzing power of nuclear fragmentation of relativistic deuterons with proton emission at non-zero angles.** Azhgirej, L.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Yudin, N.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 16p. Order Number DE94606589. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Phys., A.

Tensor analyzing powers T_{20} and T_{22} of the reaction of the fragmentation of relativistic deuterons on protons with proton emission at non-zero angles are considered in the framework of the light front dynamics in the relativistic momentum approximation. The calculations for the 9 GeV/c polarized deuterons have been carried out with the deuteron wave functions corresponding to the Paris, Reid soft core, Bonn and Moscow potentials of N-N scattering. An experimental investigation of the tensor analyzing power of the deuteron fragmentation with the emission of protons with large transverse momenta is proposed to use for obtaining information on the deuteron structure at small distances. 20 refs.; 5 figs.

2500 (JINR-E–2-92-320) **Neutron-induced particle production in the cumulative and noncumulative regions at intermediate energies.** Mashnik, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 22p. Order Number DE94606570. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Phys., A.

The first systematic measurements of neutron-induced inclusive production of protons, deuterons, tritons and charged pions on carbon, copper, and bismuth in the bombarding energy range of 300-580 MeV and in the angular interval from 51 deg to 165 deg have been analyzed in the framework of the cascade-exciton model. The role of single-particle scattering, the effects of rescattering, the pre-equilibrium emission and 'coalescence' mechanism in particle production in the cumulative (i.e., kinematically - forbidden for quasi-free intranuclear projectile-nucleon collisions) and noncumulative regions are discussed. A week sensitivity of the inclusive distributions to the specific reaction mechanisms and a need of correlation and polarization measurements are noted. 27 refs.; 12 figs.; 1 tab.

2501 (JINR-E–2-92-424) **Electrodisintegration of the deuteron near threshold with allowance for meson exchange currents. Retardation effects.** Burov, V.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Sus'kov, S.Eh.; Goj, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 19p. Order Number DE94606565. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Phys., A.

The electrodisintegration of the deuteron near threshold with allowance for retardation effects in meson exchange currents (MEC) has been investigated depending on vertex form factors and cut-off parameters. It is shown that the retardation effects should be taken into account in MEC at large transfer momenta ($t>12$ fm^{-2}). It is found for the differential cross section that the contribution of MEC is strongly dependent on the vertex form factors and cut-off parameters. The role of p-meson contribution in MEC with allowance for retardation effects has been investigated. It is shown that the inclusion of retardation effects leads to the decrease of the p-meson influence at large transfer momenta. The radial dependence of the matrix elements with allowance for retardation effects has been studied. It was shown that the inclusion of meson exchange currents is essentially important in the range of r=1-1.5 fm when $t<30$ fm^{-2}. 34 refs.; 12 figs.

2502 (JINR-E–2-93-9) **Microscopic calculations of nucleon-nucleus scattering in glauber theory.** Omboo, Z. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 8p. Order Number DE94606571. Source: OSTI; NTIS (US Sales Only); INIS.

A method of the microscopic calculation of nucleon-nucleus and nucleus-nucleus scattering is obtained in the framework of the Glauber theory. Good descriptions of the elastic scattering amplitude of pd, pa, a^{12}C interactions are obtained in the framework of nonrelativistic quark-cluster model. 32 refs.; 4 figs.

2503 (JINR-E–2-93-16) **Polarization transfer in deuteron break-up at 0 deg measuring with ANOMALON polarimeter at JINR synchrophasotron.** Golutvin, I.A. (and others); Khabarov, V.S.; Perelygin, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 4p. Order Number DE94606590. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the 10-th Intern. Symposium SPIN 92 on HIGH ENERGY SPIN PHYSICS, Nagoya, November 9-14, 1992.

The new experimental results for polarization transfer in ^{12}C(d,p)X at 10 deg are presented. The ratio of the proton polarization P_p to the deuteron beam polarization P_d, $a=P_p/P_d$ has been measured uo to the high intradeuteron momentum k=550 MeV/c, where intriguing tendency of a-behaviour can be indicated. 10 refs.; 2 figs.

2504 (JINR-E–3-92-465) **Testing T-odd, p-even interactions with gamma-rays from neutron p-wave resonances.** Barabanov, A.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Sharapov, E.I.; Skoy, V.R.; Frankle, C.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 10p. Order Number DE94606572. Source: OSTI; NTIS (US Sales Only); INIS.

A new method for the study of time reversal violation is described. It consists of measurements of the forward-backward asymmetry in individual gamma-ray transitions resulting from unpolarized neutron capture in p-wave resonance. An experiment with a ^{113}Cd target performed at the Dubna pulsed neutron source has been analyzed and a limit on the time reversal odd, parity even interaction extracted. The possibilities of experiments using the powerful pulsed neutron source at Los Alamos are considered. 23 refs.; 2 figs.

2505 (JINR-E–4-92-138) **Scattering of ^{3}He on ^{12}C and inelastic form factor.** Dem'yanova, A.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Ogloblin, A.A.; Svinareva, E.F.; Ershov, S.N.; Gareeva, F.A.; Kazacha, G.S.; Goncharov, S.A.; Vaagen, J.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 18p. Order Number DE94606591. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Phys.

Measurements of inelastic scattering of ^{3}He on ^{12}C at E_{He}=72 MeV with excitation of low-lying 2^+, 3^-, 0^+ states of the target are reported. The data was analyzed both by DWBA and coupled channels approximation, the latter leading to only minor changes, and it is shown that nuclear rainbow effects are present. It is possible to reproduce the main features of the 2^+ and 3^- inelastic angular distributions by means of the optical model potential previously selected for the reaction (^{3}He, t) on ^{13,14}C targets. The fit is improved in detail and can be made nearly perfect if more flexible model-independent form factors are employed. An alternative approach is also discussed. 14 refs.; 8 figs.; 2 tabs.

2506 (JINR-R–1-92-193) **Effective mass spectra of three secondary protons in the (p, 3p) reaction on the ^{12}C nucleus at 660 MeV.** Budyashov, Yu.G.; Nadezhdin, V.S.; Petrov, N.I.; Satarov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 6p. (In Russian). Order Number DE94606573. Source: OSTI; NTIS (US Sales Only); INIS.

Data on effective mass spectra for a system of three secondary protons are presented. The data have been obtained with a three-arm spark spectrometer in investigations of mechanisms for the (p, 3p) reaction on the carbon nucleus at 660 MeV in different experimental geometries. The total spectrum for all experimental geometries covers the mass range from 3060 MeV to 3300 MeV. The effective mass spectra obtained for the system of three

secondary protons are well described within the errors by the calculated distributions that correspond to contributing reaction mechanisms in each experimental geometry. Thus a structure, which could be regarded as manifestation of three-proton resonances produced in the intermediate state, was not found with the statistics available for the effective mass spectra. 8 refs.; 2 figs.

2507 (JINR-R–1-92-262) **Dependence of spectra and cross sections of proton yield at fixed angles on the atomic weight of colliding nuclei in nucleus-nucleus interactions at 4.2 GeV/c per nucleon.** Backovic, S. (and others); Boldea, V.; Diza, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1992. 20p. (In Russian). Order Number DE94606561. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The invariant cross sections of proton production depending on their kinetic energy within an interval of 50-400 MeV at fixed angles from 0 up to 180 for (p,dα, C)+C- and (d,α,C)+Ta-interactions at 4.2 GeV/c per nucleon are presented. It is shown that the shape of proton spectra in investigated energy interval and at emission angles of $\theta > 30$ deg does not depend on the type of the projectile nucleus in interactions between light nuclei and carbon nucleus. Proton spectra at $\theta > 20$ deg are similar in the region of 50-200 MeV (d,α,C) collisions with tantalum nuclei. The atomic weight of target-nucleus is also shown to affect substantially the shape of proton spectra over the interval of $50 \leq T < 200$ MeV and $\theta < 90$ deg and the shape of spectra of faster protons ($200 \leq T \leq 400$ MeV) does not depend on A_T from $\theta = 20$ deg. The dependences of the cross sections of proton yield at fixed angles on the atomic weights of colliding nuclei have investigated. In every angular interval the $d\sigma/d\Omega$ dependence on A_p can be presented by a power function $(A_p{}^{\alpha}{}_p)$ for interactions on both light and heavy tergets. The angular dependences of the parameters $\alpha_p{}^C$ and $\alpha_p{}^{Ta}$ have been obtained. The parameters $\alpha T^d, \alpha, C \simeq 1$ at $\theta < 50$ deg and they grow up to ≈ 1.5 within an interval of 120 deg $\leq \theta \leq 180$ deg for the power dependence $d\sigma/d\Omega$ on the atomic weight of the target-nucleus. 27 refs.; 16 figs.; 4 tabs.

2508 (JINR-R–1-92-512) **Study of mechanisms for the reaction of direct knock-on of proton pairs from the carbon nucleus by 660 MeV protons.** Budyashov, Yu.G.; Nadezhdin, V.S.; Petrov, N.I.; Satarov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 15p. (In Russian). Order Number DE94606574. Source: OSTI; NTIS (US Sales Only); INIS.

The paper presents the results obtained in a kinematically full experiment carried out at the JINR phasotron with a three-arm spark spectrometer for studying mechanisms for the (p,3p) reaction of knock-on of proton pairs from the carbon nucleus by 660 MeV protons. 8 refs.; 7 figs.; 1 tab.

2509 (JINR-R–3-93-11) **Program for calculation of $^{16}O(^4He, ^4He)^{16}O$ reaction cross section at 2,4-4 MeV.** Chernenko, N.V.; Chernenko, L.P.; Shirokov, D.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 14p. (In Russian). Order Number DE94606592. Source: OSTI; NTIS (US Sales Only); INIS.

Computer program is developed for the calculation of a cross section for resonance elastic scattering of helium ions on oxygen. The program has been tested in the measurement of backscattering spectra on an amorphous film of SiO_2 on a silicon substrate. The text of the program in the FORTRAN language is given. The approximating formula to describe resonance with acceptable accuracy any calculation speed in a majority of cases is suggested. 14 refs.; 2 figs.; 1 tab.

2510 (JINR-R–7-92-360) **Influence of angular momentum on fission fragment mass and energy distributions.** Chubaryan, G.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Luk'yanov, S.M.; Penionzhkevich, Yu.Eh.; Salamatin, V.S.; Itkis, M.G.; Okolovich, V.N.; Rusanov, A.Ya.; Smirenkin, G.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1992. 42p. (In Russian). Order Number DE94606594. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The present paper is devoted to a systematic study of the influence of the angular momentum and excitation energy on the mean kinetic energy, and on the dispersions of the mass and energy distributions of the fission fragments ($\sigma_M{}^2$, $\sigma_E{}^2$) of the excited nuclei Po and Ku produced in various projectile-target combinations and at two energies of the incident ion for each combination. The measurements were made with the double-arm time-of-flight spectrometer of the set-up DEMAS. 59 refs.; 14 figs.; 5 tabs.

2511 (JINR-R–10-92-214) **Electronic guide for pion and nucleon nuclear cross sections.** Barashenkov, V.S.; Gareeva, G.F.; Polanski, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 4p. (In Russian). Order Number DE94606605. Source: OSTI; NTIS (US Sales Only); INIS.

A short description of possibilities and ways of the use of program, which gives interactively on the screen of the display or on the body of another program the values of the total integral σ_t and total elastic cross-sections σ_{el} for the interaction of protons, neutrons, π^+, π^-, π^0-mesons with nuclei in the range of laboratory energies from 14 MeV up to 10 GeV is given. 4 refs.

2512 (LA-UR–93-2949) **Spin-hole doping in the Kondo insulator $Ce_3Bi_4Pt_3$ studied by neutron scattering.** Severing, A. (Institut Laue-Langevin, 38 - Grenoble (France)); Perring, T.; Thompson, J.D.; Fisk, Z.; Canfield, P.C. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930865–4: International conference on strongly correlated electron systems, La Jolla, CA (United States), 16-19 Aug 1993). Order Number DE93040107. Source: OSTI; NTIS; INIS; GPO Dep.

To investigate the effect of non-magnetic impurities on gap formation and stability in Kondo insulators, we have performed inelastic neutron scattering experiments on $(Ce_{1-x}La_x)_3Bi_4Pt_3$, with x = 0.0, 0 1, 0.25 and 1.0. Data were collected at the Rutherford spallation source using incident neutron energies of 30 and 100 MeV and with the sample temperature fixed at 10K, well below $\Delta g/k_B$. The gap edge, defined from the rapid onset of scattering intensity, decreases quadratically with La content. However, the energy Δ_g at which the magnetic intensity reaches one-half its maximum value scales with x and the temperature T_{max} at which the static susceptibility is maximum. $\Delta g/k_B T_{max}$ is independent of x and equal to 2.5 ± 0.1, a value curiously close to the total angular momentum of Ce^{3+}. Three important conclusions are drawn from the these observations: (1) As suggested theoretically, T_{max} does provide a measure of the gap produced in the spin-excitation spectrum of Kondo insulators. (2) Creation of spin holes by thermal excitation or La substitution has comparable effects on the gap. (3) The existence of a spin gap even with significant perturbation in the Ce-sublattice periodicity suggests that coherence effects are not important for the existence of the gap and that spin dynamics are determined locally.

2513 (LA-UR–93-3236) **Neutron induced fission of U isotopes up to 100 MeV.** Lestone, J.P.; Gavron, A. Los Alamos National Lab., NM (United States). 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309253–1: 12. meeting on physics of nuclear fissions, Obninsk (Russian Federation), 27-30 Sep 1993). Order Number DE94000801. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a statistical model description of the neutron induced fission of U isotopes using densities of intrinsic states and spin cut off parameters obtained directly from appropriate Nilsson model single particle levels. The first chance fission cross sections are well reproduced when the rotational contributions to the nuclear level densities are taken into account. In order to fit the U(n,f) cross sections above the threshold of second chance fission, we need to: (1) assume that the triaxial level density enhancement is washed out at an excitation energy of ~7 MeV above the triaxial barriers with a width of ~1 MeV, implying a γ deformation for the first barriers of $10° < \gamma < 20°$; and (2) include pre-equilibrium particle emission in the calculations. Above an incoming neutron kinetic energy of ~17 MeV our statistical model U(n,f) cross sections increasingly overestimate the experimental data when so called "good" optical model potentials are used to calculate the compound nucleus formation cross sections. This is not surprising since at

these high energies little data exists on the scattering of neutrons to help guide the choice of optical model parameters. A satisfactory reproduction of all the available U(n,f) cross sections above 17 MeV is obtained by a simple scaling of our calculated compound nucleus formation cross sections. This scaling factor falls from 1.0 at 17 MeV to 0.82 at 100 MeV.

2514 (LA-UR–93-3334) **Calculations of Bose-Einstein correlations from Relativistic Quantum Molecular Dynamics.** Sullivan, J.P. (Los Alamos National Lab., NM (United States)); Berenguer, M.; Fields, D.E.; Jacak, B.V.; Sarabura, M.; Simon-Gillo, J.; Sorge, H.; van Hecke, H.; Pratt, S. Los Alamos National Lab., NM (United States); Argonne National Lab., IL (United States). 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ;W-31109-ENG-38. (CONF-930636–4: 10. international conference on ultra-relativistic nucleus-nucleus collisions, Borlaenge (Sweden), 20-24 Jun 1993). Order Number DE94000794. Source: OSTI; NTIS; INIS; GPO Dep.

Bose-Einstein correlation functions which are in good agreement with pion data can be calculated from an event generator. Here pion and (preliminary) kaon data from CERN experiment NA44 are compared to the calculations. The dynamics of 200 GeV/nucleon ^{32}S + Pb collisions are calculated, without correlations due to interference patterns of a many-body wavefunction for identical particles, using the Relativistic Quantum Molecular Dynamics model (RQMD). The model is used to generate the phase-space coordinates of the emitted hadrons at the time they suffer their last strong interaction (freeze-out). Using the freeze-out position and momentum of pairs of randomly selected identical particles, a two-particle symmetrized wave-function is calculated and used to add two-body correlations. Details of the technique have been described previously. The method is similar to that used in the Spacer program.

2515 (LA-UR–93-3429) **Low p_T phenomena observed in high energy nuclear collisions.** Simon-Gillo, J. Los Alamos National Lab., NM (United States). 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930636–3: 10. international conference on ultra-relativistic nucleus-nucleus collisions, Borlaenge (Sweden), 20-24 Jun 1993). Order Number DE94000825. Source: OSTI; NTIS; INIS; GPO Dep.

For several decades, experiments have reported an enhancement in the pion invariant cross section at low p_T (< 300 MeV/c) when compared to a thermal fit or minimum bias pp results. Experimental results from pp reactions at the ISR to heavy ion collisions at CERN wi be reviewed then compared to extract trends. Several theoretical explanations will be discussed. An emphasis will be placed on the role of resonances and a comparison of data to models will be presented.

2516 (SAND–92-2551C) **Neutron dosimetry with the $^{58}Ni(n,p)^{58}Co$ reaction at short-decay times.** Griffin, P.J.; Holm, C.V.; Vehar, D.W.; Kelly, J.G. Sandia National Labs., Albuquerque, NM (United States). [1992]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930809–5: 8. ASTM-EURATOM symposium on reactor dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE93040901. Source: OSTI; NTIS; GPO Dep.

The $^{58}Ni(n,p)^{58}Co$ reaction is a very attractive choice for use as shown a neutron fluence monitor foil in reactor irradiations. The most important drawback to this reaction is the interference from the 9.15-h half-life ^{58m}Co metastable state. A methodology is presented in this paper to allow the ^{58g}Co ground-state activity to be read at short decay times and to be converted into the total ^{58t}Co activity with no significant increase in the measurement uncertainty. This methodology involves modeling the $^{58m}Co/^{58t}Co$ population ratio. Both theoretical and experimental estimates of the energy dependence of this ratio are presented. A method is presented to accurately measure this ratio. An empirical model of the energy dependence of this ratio is presented to allow simple estimates of the ratio to be made prior to a measurement.

2517 (UCRL-JC–112168) **Multifragment source lifetime in intermediate energy heavy ion collisions.** Sangster, T.C. (Lawrence Livermore National Lab., CA (United States)); Britt, H.C.; Namboodiri, M.N.; Begemann-Blaich, M.; Blaich, Th.; Elmaani, A.; Ajitanand, N.N. Lawrence Livermore National Lab., CA (United States). Nov 1992. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9209306–3: International School of Nuclear Physics on heavy ion collisions at intermediate and relativistic energies, Sicily (Italy), 7-16 Sep 1992). Order Number DE94000306. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication GOLD 197 TARGET/iron 56 reactions; DISTRIBUTION FUNCTIONS; LIFETIME; NUCLEAR FRAGMENTATION

2518 (UCRL-JC–112925) **Target rapidity baryon distributions in ^{28}Si + ^{197}Au and ^{197}Au + ^{197}Au collisions at 14.6 and 11.7 A·GeV/c.** Sangster, T.C.; Costales, J.B.; Namboodiri, M.N. E802 Collaboration. Lawrence Livermore National Lab., CA (United States). 25 Feb 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930173–12: HIPAGS 93: workshop on heavy ion physics at the alternating gradient synchrotron, Cambridge, MA (United States), 14-17 Jan 1993). Order Number DE93040213. Source: OSTI; NTIS; GPO Dep.

Proton and deuteron kinetic energy spectra have been measured at target rapidities for both minimum bias and central collisions of 14.6 A·GeV/c ^{28}Si and 11.7 A·GeV/c ^{197}Au beams with a ^{197}Au target. The spectra were measured from a low energy threshold of approximately E_{kin}=35 MeV to well over 200 MeV for laboratory angles of 50° to 130° ($|\eta| \leq 0.76$). The acceptance-corrected spectra have been fit over a limited range of kinetic energies using a Boltzmann distribution. The integrated yields and the inverse slope parameters are presented as a function of centrality for the ^{28}Si + ^{197}Au reaction and as a function of trigger for the ^{197}Au + ^{197}Au reaction. These quantities are also compared with the proton spectra generated using both the ARC and RQMD codes.

6635 Nuclear Mass Ranges

Refer also to citation(s) 732, 2327, 2374, 2429, 2431, 2443, 2446, 2452, 2454, 2456, 2457, 2458, 2459, 2461, 2467, 2468, 2469, 2474, 2475, 2476, 2477, 2479, 2480, 2481, 2483, 2484, 2485, 2487, 2490, 2491, 2492, 2494, 2495, 2500, 2507, 2513, 2516, 2517, 2518, 2794

6636 Radiation Physics

Refer also to citation(s) 491, 1465, 1474, 1802, 1809, 1853, 2594, 2766

2519 (CONF-911296–11-App.4) **X-ray amplifier energy deposition scaling with channeled propagation.** Boyer, K. (and others); Luk, T.S.; McPherson, A. Illinois Univ., Chicago, IL (United States). Dept. of Physics. [1991]. 5p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract FG02-89ER60898. Contract AFOSR-89-0159;N00014-91-J-1106;N00014-91-K-2013;DAAL 3- From 14. international conference on laser and applications; San Diego, CA (United States); 8-13 Dec 1991. Order Number DE93017912. Source: OSTI; NTIS; INIS; GPO Dep.

The spatial control of the energy deposited for excitation of an x-ray amplifier plays an important role in the fundamental scaling relationship between the required energy, the gain and the wavelength. New results concerning the ability to establish confined modes of propagation of sort pulse radiation of sufficiently high intensity in plasmas lead to a sharply reduced need for the total energy deposited, since the concentration of deposited power can be very efficiently organized.

2520 (INIS-mf–13731, pp. 53) **Neutron spectrum measurements using electrochemically etched CR-39: spectrum unfolding procedures.** Majeed, A. (Inst. of Industrial Automation, Islamadad (Pakistan)); Ahmed, S.M.; Durrani, S.A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SPECTRA/dielectric track detectors; ELECTROCHEMISTRY; ETCHING; SPECTRA UNFOLDING

2521 (INIS-SU–340/A) **Summaries of reports of the 22. Conference of physics of charged particle interaction with crystals.** AN SSSR, Makhachkala (Russian Federation). Fizicheskij Inst.; Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 122p. (In Russian). (CONF-9205318–: 22. Conference on physics of charged particle interaction with crystals, Moscow (Russian Federation), 25-27 May 1992). Order Number DE93620575. Source: OSTI; NTIS (US Sales Only); INIS.

ISBN 5-211-02900-3; published in Moscow State University.

The papers were processed separately for the data base.

2522 (JAERI-M–93-135) **Criticality parameters and data for various nuclear fuel materials in infinite dimensions: Calculations with the combination of MGCL-J3 and SIMCRI.** Okuno, Hiroshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Komuro, Yuichi; Naito, Yoshitaka; Umeda, Kentaro. Japan Atomic Energy Research Inst., Tokyo (Japan). Aug 1993. 104p. (In Japanese). Order Number DE94719023. Source: OSTI; NTIS; INIS.

Nuclear criticality parameters and data were calculated for various nuclear fuel materials in infinite dimensions with the combination of MGCL-J3 library and SIMCRI code. Eight kinds of nuclear fuel materials were dealt with : U-H_2O, UO_2-H_2O, UO_2F_2 solution, $UO_2(NO_3)_2$ solution, Pu-H_2O, PuO_2-H_2O, $Pu(NO_3)_4$ solution and $PuO_2 \cdot UO_2$-H_2O. The criticality parameters given in this report, which are helpful to estimate critical dimensions, are the infinite-medium multiplication factor k_∞, migration area M^2 and diffusion constant D. The nuclear criticality data reported here are the estimated criticality lower-limit enrichment, the estimated criticality lower-limit concentration and data expressed in the form of drawings for subcriticality judgement. These are useful in controlling the nuclear criticality safety. MGCL-J3 was a multi-group constant library generated from the evaluated nuclear data file JENDL-3 and included in the Nuclear Criticality Safety Code System JACS. The nuclear criticality parameters and data were found to have little difference from those obtained with the old version of the multi-group constant library MGCL-B-IV. (author).

2523 (JAERI-M–93-143) **Development of BERMUDA : a radiation transport code system, 2: Gamma rays transport codes.** Suzuki, Tomoo (Nuclear Energy Data Center, Tokai, Ibaraki (Japan)); Hasegawa, Akira; Tanaka, Shun-ichi; Nakashima, Hiroshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 90p. Order Number DE94718964. Source: OSTI; NTIS; INIS.

A radiation transport code system BERMUDA has been developed for one-, two- and three-dimensional geometries. In the present report as Part II, development of gamma rays transport codes is reported. Group-angle transfer matrix is calculated by numerically integrating the Klein-Nishina formula for Compton scattering, taking energy-angle correlation into account. Pair production and annihilation of electrons are also contained in the matrix. A first collision source method is used for a case of point source. Angular flux distribution is obtained by integrating the transport equation over the line segment along each angular discrete ordinate at each spatial mesh point. A fine energy grid (subgroup having equal energy width) method is used, with a rebalancing scheme concerning the number of gain and loss of photons over each coarse mesh region and also in each energy grid. Energy range of photons is from 14 MeV to 10 keV. As to group constants, three kinds of libraries with photon energy group structure up to 41 groups have been prepared to contain total (attenuation) cross sections and secondary gamma rays production constants from each of neutron groups. A benchmark test has been performed by analyzing a secondary gamma-ray heating experiment performed at the FNS facility in JAERI. In the present report, the calculational methods of photon transport in the BERMUDA code system are briefly described. As a main purpose of this report, input data specifications, job control languages and output data are given as a user's manual for the following four gamma rays transport codes: BERMUDA-1DG : sphere, slab (S_{20}), BERMUDA-2DG : cylinder (S_8), BERMUDA-2DG-S16 : cylinder (S_{16}), BERMUDA-3DG : rectangular parallelepiped (S_8). (J.P.N.).

2524 (JINR-R–3-92-186) **Anomalous behaviour of the diamagnetic profile near the superconducting niobium boundary with vacuum.** Korneev, D.A.; Chernenko, L.P.; Petrenko, A.V.; Balalykin, N.I.; Skrypnik, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 7p. (In Russian). Order Number DE94606662. Source: OSTI; NTIS (US Sales Only); INIS.

The profile of the stationary field penetrating into the superconducting niobium films was measured by specular reflection of thermal polarized neutrons. The measurements are done on the polarized neutron spectrometer SPN at the pulsed reactor IBR-2 in Dubna. 7 refs.; 1 fig.

2525 (JINR-R–4-92-471) **Superslow neutrons and the dispersion law of neutron waves in matter.** Nosov, V.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Frank, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 31p. (In Russian). Order Number DE94606663. Source: OSTI; NTIS (US Sales Only); INIS.

The behaviour of super slow neutrons having velocities less than $\approx$0.1 m/s cannot be described with an average or optical potential. Strictly speaking, because of this region existence, the wave vector in a medium becomes complex when scattering length of single nuclei is positive. As the consequence the ultracold neutrons with energies below the boundary energy start being slowly infiltrated into matter at large depth. The slow absorption being accounted for leads to a second branch in spectrum of neutron waves. It is characterized by much longer attenuation length than predicts the conventional theory of a complex potential. The paper is concluded with a discussion on the possibility of the experimental verification of the theory. 18 refs.; 1 fig.

2526 (LA-UR–93-3448) **Los Alamos National Laboratory accelerator production of tritium project: Topical report, Radionuclide production experiment.** Ullmann, J.L.; Gavron, A.; King, J. Los Alamos National Lab., NM (United States). [1993]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94000701. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The accelerator production of tritium relies on a high-energy proton beam to produce spallation neutrons and lower mass residual nuclei. Radionuclide production over a wide energy range must be considered. The calculation of radionuclide production in a thick target involves two different processes. First the transport of the incident particles and their reaction products, including neutrons, must be considered in detail. Second the probability for production of a given radionuclide in a reaction must be calculated. The design of targets involves elaborate calculations with monte carlo transport and particle production codes. These codes follow every particle produced until it either slows down to the point of stopping, or vanishes due to the interaction with an atomic nucleus. The probability that a particle will interact at any point in a material is determined by its cross section. Very few measurements have been made for neutrons at higher energies or for all particles. When cross sections are not available, the calculations use physics models. The models provide reasonable descriptions of cross sections but often do not give the correct ratio between the different kinds of emitted particles. Consequently the calculations performed using Monte-Carlo Neutron and Photon (MCNP) and the Los Alamos High Energy Transport codes (LAHET) are not completely accurate. We have performed a benchmark experiment to measure the production of radioisotopes in stopping-length W and Pb targets irradiated by an 800 MeV proton beam, and are comparing our results to values obtained from calculations using LAHET and MCNP. The experiment was designed to pay particular attention to the short-life radionuclides, which have not been previously measured. In the following, we present details of the experiment, explain how we analyze the data and obtain the results, how we perform the calculations and finally, how the experimental data agree with the calculations.

2527 (UCRL-ID–113831) **TART calculations of neutron attenuation and neutron-induced photons on 5% and 20% borated polyethylene slabs.** Wuest, C.R. Lawrence Livermore National Lab., CA (United States). 20 Apr 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94000951. Source: OSTI; NTIS; INIS; GPO Dep.

The coupled neutron/photon transport code TART has been used to calculate the attenuation of neutrons and the production of induced photons for neutrons incidents on 5% and 20% borated polyethylene slabs. The neutron attenuation lengths are found to be 2.4 cm and 2.9 cm for 5% and 20% borated polyethylene, respectively.

2528 (WAPD-T–2953) **Monte Carlo next-event point flux estimation for RCP01.** Martz, R.L.; Gast, R.C.; Tyburski, L.J. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-910414–42: International topical meeting on advances in mathematics, computation and reactor physics, Pittsburgh, PA (United States), 28 Apr - 2 may 1991). Order Number DE94002521. Source: OSTI; NTIS; INIS; GPO Dep.

Two next event point estimators have been developed and programmed into the RCP01 Monte Carlo program for solving neutron transport problems in three-dimensional geometry with detailed energy description. These estimators use a simplified but accurate flux-at-a-point tallying technique. Anisotropic scattering in the lab system at the collision site is accounted for by determining the exit energy that corresponds to the angle between the location of the collision and the point detector. Elastic, inelastic, and thermal kernel scattering events are included in this formulation. An averaging technique is used in both estimators to eliminate the well-known problem of infinite variance due to collisions close to the point detector. In a novel approach to improve the estimator's efficiency, a Russian roulette scheme based on anticipated flux fall off is employed where averaging is not appropriate. A second estimator successfully uses a simple rejection technique in conjunction with detailed tracking where averaging isn't needed. Test results show good agreement with known numeric solutions. Efficiencies are examined as a function of input parameter selection and problem difficulty.

2529 (WAPD-T–2954) **Monte Carlo simulation of gamma ray scanning gauge.** Hartfield, G.L.; Freeman, L.B.; Dei, D.E.; Emert, C.J.; Glickstein, S.S.; Kahler, A.C.; Niedzwecki, P.F. Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab. [1990]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195 ;AC11-89PN38014. (CONF-9004372–1: American Nuclear Society topical meeting on advances in mathematics, computations and nuclear physics, Pittsburgh, PA (United States), 28 Apr - 1 may 1990). Order Number DE94001761. Source: OSTI; NTIS; INIS; GPO Dep.

A gamma ray scanning gauge was simulated with Monte Carlo to study the properties of gamma scanning gauges and to resolve the counts coming from a ^{235}U source from those coming from a contaminant (^{232}U) whose daughters emit high energy gamma rays. The simulation has been used to infer the amount of the ^{232}U contaminant in a ^{235}U source to select the best size for the NaI(Tl) detector crystal to minimize the effect of the contaminant. The results demonstrate that Monte Carlo simulation provides a systematic tool for designing a gauge with desired properties and for estimating properties of the gamma source from measured count rates.

6640 Atomic and Molecular Physics

Refer also to citation(s) 2417

2530 (DOE/ER/13958–43) **Semiempirical studies of atomic structure: Progress report, 1 July 1991–1 October 1993.** Curtis, L.J. Toledo Univ., OH (United States). Dept. of Physics and Astronomy. [1993]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER13958. Order Number DE94001588. Source: OSTI; NTIS; GPO Dep.

Atomic structure/properties of highly ionized many-electron systems are studied using sensitive semiempirical data systematization, experiment, and theory. Measurements are made using fast ion beams, combined with data from laser- and tokamak-produced plasmas, astrophysical sources, and light sources. Results during this 3-y period are discussed under the following headings: Invited review article (decay rates in systems of negative ions to very heavy one-electron ions), fast ion beam lifetime measurements (Pt sequence, neutral carbon, Na sequence), multiplexed decay curve measurements, multiplexed decay curve measurements (lifetimes of alkali-like resonance transitions, spin-forbidden intercombination lines), lifetimes in Ne sequence, lifetimes for H and He sequences, data-based semiempirical formulations, calculations, and accelerator studies.

6641 Theory of Electronic Structure of Atoms and Molecules

2531 (ANL/CHM/CP–80473) **A discussion of some aspects of the MCSCF method.** Shepard, R. Argonne National Lab., IL (United States). [1992]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9208237–2: Relativistic and electron correlation effects in molecules and solids, Vancouver (Canada), 9-22 Aug 1992). Order Number DE93019011. Source: OSTI; NTIS; INIS; GPO Dep.

After a brief overview of the MCSCF (Multi-Configuration Self-Consistent-Field) method, a more detailed examination of the underlying model is undertaken. The problem of "multiple solutions" is examined with reference to the "symmetry-breaking" problem and with emphasis on single-state cases. It is argued that the most appropriate resolution of such problems is usually case-specific, and depends on the details of how the MCSCF wave function is being used to model the chemical system rather than on features characteristic of the MCSCF wave function itself. Finally, a recently introduced MCSCF wave function optimization method based on multidimensional trigonometric interpolation is briefly discussed.

2532 (LA-UR–93-2888) **Magnetic instability of Kondo insulators.** Wang, Ziqiang (Los Alamos National Lab., NM (United States)); Li, Xiao-Ping; Lee, Dung-Hai. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930865–3: International conference on strongly correlated electron systems, La Jolla, CA (United States), 16-19 Aug 1993). Order Number DE93040064. Source: OSTI; NTIS; GPO Dep.

We review a number of experiments on isoelectronic, isostructural ternary compounds CeTSn (T=Ni,Pd,Sn) and alloys $CeNi_{1-x}(Pd,Pt)_xSn$, and propose a finite temperature phase diagram describing the evolution of a Kondo insulator to an antiferromagnetic Kondo state with decreasing hybridization or Kondo coupling. We then provide microscopic justifications for the phase diagram by analyzing the magnetic properties of the symmetric Kondo lattice model in two dimensions.

2533 (LRAP–134) **Theoretical and experimental investigation of atomic radiative lifetimes and hyperfine structures.** Joensson, Per. Lund Univ. (Sweden). Dept. of Physics. 1992. 27p. Order Number DE94606673. Source: OSTI; NTIS; INIS.

Atomic radiative lifetimes and hyperfine structures as well as other properties, such as total energy and specific mass shift, have been studied theoretically and experimentally. Computer programs to calculate hyperfine structure constants from non-relativistic multiconfiguration Hartree-Fock (MCHF) and relativistic multiconfiguration Dirac-Fock (MCDF) wavefunctions have been written. Using these programs large-scale calculations of hyperfine structures in lithium and sodium have been performed. It is shown, that the MCHF method is able to predict hyperfine structures to an accuracy of a few per mille in lithium, whereas for the more complex hyperfine structures to an accuracy of a few per mille in lithium, whereas for the more complex sodium atom an accuracy of a few per cent is obtainable. For lithium convergence of the total energy, ionization energy, specific mass shift and hyperfine parameters has been studied with the MCHF method. Radiative lifetimes and hyperfine structures of excited states in sodium and silver have been experimentally determined using time-resolved laser spectroscopy.

By recording the fluorescence light decay curves following VUV excitation, the radiative lifetimes and hyperfine structures of the $7p^2P$ states in silver were measured. The delayed-coincidence technique has been used to make very accurate measurements of the radiative lifetimes and hyperfine structures of the lowest P states in sodium and silver.

2534 (UCRL-JC–114367) **Relativistic configuration interaction calculation of the correlation energies of highly-charged ions.** Chen, M.H. (Lawrence Livermore National Lab., CA (United States)); Cheng, K.T.; Johnson, W.R. Lawrence Livermore National Lab., CA (United States). Jul 1993. 2p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-48. Grant PHY-92-04089. Order Number DE94001055. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. MULTICHARGED IONS/electron correlation; ELECTRON CORRELATION/calculation methods; RELATIVISTIC RANGE; ELECTRONIC STRUCTURE; SPLINE FUNCTIONS; HAMILTONIANS; QUANTUM ELECTRODYNAMICS; DIRAC EQUATION

2535 (UCRL-JC–114857) **Limits on high-order harmonic generation from single-atom calculations.** Kulander, K.C.; Schafer, K.J. Lawrence Livermore National Lab., CA (United States). 18 Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306125–4: 6. international conference on multiphoton processes, Quebec City (Canada), 25-30 Jun 1993). Order Number DE93019950. Source: OSTI; NTIS; GPO Dep.

In the quantum mechanical calculations of electron and photon emission from atoms in strong laser fields we have employed a single-active-electron (SAE) model. We determine the effect of the time varying electric field of the laser on each of the valence electrons separately. The active electron in each calculation moves in the time-independent mean field of the remaining, unexcited electrons and the nucleus. This approach works well for the rare gas atoms, at least partially because the neglected double or higher excitations involve states well above the ionization threshold. The photoelectron and photon emission spectra calculated using this technique agree quantitatively with observed emission rates. In this paper we will present a simple semiclassical model for high intensity ionization which reproduces the observed harmonic emission spectra obtained in this regime and which provides considerable insight into the dynamics of this process. The basic models has been used in the past to predict electron energy distributions in the tunneling regime and we will use it here for harmonics.

6642 Spectra of Atoms and Molecules and Their Interactions With Photons

Refer also to citation(s) 177, 1149, 1151, 1277, 1607, 2586

2536 (ANL/CHM/PP–79176) **Direct detection of atomic ions from molecular photofragmentation during nonresonant multiphoton ionization of sputtered species.** Coon, S.R. (Argonne National Lab., IL (United States)); Calaway, W.F.; Pellin, M.J.; Burnett, J.W.; White, J.M. Argonne National Lab., IL (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040886. Source: OSTI; NTIS; INIS; GPO Dep.

The photoionization of sputtered Cu, Al, and Ru atoms and dimers was investigated by measuring velocity distributions using both resonant and nonresonant photoionization. Nonresonant ionization produced an atomic distribution that peaked at the same velocity as the respective dimer distribution, indicating that virtually all the nonresonant atomic ion signal is from photofragmented dimers. Various mechanisms of dimer photofragmentation are discussed. Domination of the atomic photoion channel by molecule fragmentation appears to be a general phenomenon that must be accounted for in all gas-phase multiphoton nonresonant ionization experiments at easily achievable laser power densities ($\leq 10^9$ W/cm^2).

2537 (BNL–48923, pp. 169-172) **Dynamical analysis of highly excited molecular spectra.** Kellman, M.E. (Univ. of Oregon, Eugene (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this program is new methods for analysis of spectra and dynamics of highly excited vibrational states of molecules. In these systems, strong mode coupling and anharmonicity give rise to complicated classical dynamics, and make the simple normal modes analysis unsatisfactory. New methods of spectral analysis, pattern recognition, and assignment are sought using techniques of nonlinear dynamics including bifurcation theory, phase space classification, and quantization of phase space structures. The emphasis is chaotic systems and systems with many degrees of freedom.

2538 (CEA-CONF–11378) **On the hyperfine structure in the configuration f^3ds^2 of uranium.** Avril, R. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement); Petit, A.; Ginibre, A. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement. 1993. 12p. (CONF-9301130–: OELASE '93: International symposium on lasers, sensors, applications, Los Angeles, CA (United States), 18-22 Jan 1993). Order Number DE94604966. Source: OSTI; NTIS (US Sales Only); INIS.

Experiments of technological interest for the project of laser isotope separation of uranium (Atomic Vapour Laser Isotope Separation, 'AVLIS') have yielded experimental data concerning the hyperfine structure (hfs) of levels of atomic uranium. The present paper reports on these data, their obtention and a parametric interpretation by the Condon Racah-Slater method. The experimental setup uses a Laser Induced Fluorescence technique in an atomic beam. Nevertheless, these experiments provide data for 28 low odd levels and 22 even levels, with an accuracy that is sufficient for a theoretical interpretation. Following the interpretation of the fine structure of the lower levels of atomic uranium, it was reasonable to undertake a parametric interpretation of the hfs data concerning 22 of these levels on the basis of the configuration $5f^36d7s^2$.

2539 (INIS-mf–13714, pp. 199-204) **CN emission in nitrogen afterglow at low temperatures: Detection of trace hydrocarbons in gas flows.** Talsky, A. (T.G.Masaryk University, Brno (Czech Republic). Faculty of Sciences); Janca, J.; Ricard, A.; Hochard, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A simple and fairly inexpensive new technique for qualitative and quantitative measurements of various gas-phase hydrocarbon species in a flowing gas is reported, and the apparatus for its implementation is described. The method is based on C + N chemiluminescent reactions at low temperatures. Detection of extremely low concentrations of hydrocarbon species was demonstrated. The presence of small admixtures of hydrocarbons in the nitrogen working gas increases the intensity of the CN violet band system at 77 K more than ten times with respect to that recorded at room temperature. The intensities of the CN vibrational band system emitted from the cooled part of the flowing nitrogen afterglow are very specific and can be used as a 'fingerprint' for determining trace concentrations of hydrocarbon species. (J.U.) 2 figs., 5 refs.

2540 (LA-SUB–93-275) **Relativistic atomic beam spectroscopy 2: Appendix A: Progress report, July 1, 1989–June 30, 1992: Final report.** Bryant, H.C. Los Alamos National Lab., NM (United States); New Mexico Univ., Albuquerque, NM (United States). Dept. of Physics and Astronomy. Jul 1992. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ;FG04-87ER13746. Order Number DE93040564. Source: OSTI; NTIS; GPO Dep.

This work supported by the Division of Chemical Sciences, Office of Basic Energy Services, Office of Energy Research, US Department of Energy during the period July 1, 1989 to June 30,

1992, resulted in noteworthy scientific results in three categories which we shall discuss in turn: The spectroscopy of high-lying doubly-excited states of H^-, interactions with thin foils, and multi-photon processes. Radiological safety concerns and slow beam studies are also briefly discussed.

2541 (LRAP–127) **High-resolution spectroscopy in the UV/VUV spectral region.** Larsson, Joergen. Lund Univ. (Sweden). Dept. of Physics. [1992]. 33p. Order Number DE94606679. Source: OSTI; NTIS; INIS.

The resonance spectroscopic techniques, optical double resonance and level-crossing spectroscopy, have been employed following pulsed laser excitation. The use of pulsed lasers has enabled spectroscopic studies in the UV/VUV spectral region.

2542 (LRAP–128) **Radiative lifetime and Lande-factor measurements of the Se I $4p^35S\ ^5S_2$ level using pulsed laser spectroscopy.** Zerne, R. Lund Univ. (Sweden). Dept. of Physics. Jan 1992. 35p. Order Number DE94606680. Source: OSTI; NTIS; INIS.

Diploma paper.

This diploma project consists of spectroscopic examinations of atomic selenium. Natural selenium was thermally dissociated in a quarts resonance cell keeping the background pressure of selenium molecules low by differential heating. The $4p^35S\ ^5S_2$ level was excited by frequency-tripled pulsed dye-laser radiation at 207 nm. From time-resolved recording of the fluorescence decay at 216 nm the natural radiative lifetime of the $^5S_2$ level was determined to be 493(15) ns. Quantum-beat and optical double resonance measurements in an external magnetic field yielded $g_j = 2.0004(10)$ for the Lande factor.

2543 (LRAP–135) **Time-resolved laser spectroscopy in the UV/VUV spectral region.** Bengtsson, J. Lund Univ. (Sweden). Dept. of Physics. 1992. 24p. Order Number DE94606681. Source: OSTI; NTIS; INIS.

Radiative lifetimes ranging from 3 to 500 ns were measured on various states of Ag, N, Se, Te and As, by recording the fluorescence light decay after excitation by a laser pulse. Ag was supplied by a collimated atomic beam while Se, Te and As were contained in quartz cells. Pulsed laser radiation, with a wavelength down to 185 nm, was generated by different set-ups, using Nd-YAG pumped dye lasers combined with non-linear crystals and Raman shifting. Short laser pulses were produced by a nitrogen laser or a distributed feedback dye laser. Two-photon processes and stepwise excitation were used to populate high-lying levels. Depletion spectroscopy, quantum-beat spectroscopy and optical double resonance spectroscopy were also performed.

2544 (UCRL-JC–109494) **Resonance ionization spectroscopy of zirconium atoms.** Page, R.H.; Dropinski, S.C.; Worden, E.F. Jr.; Stockdale, J.A.D. Lawrence Livermore National Lab., CA (United States). May 1992. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920574–16: 6. international symposium on resonance ionization spectroscopy (RIS) and its applications, Santa Fe, NM (United States), 24-29 May 1992). Order Number DE94001040. Source: OSTI; NTIS; INIS; GPO Dep.

We have examined the stepwise-resonant three-photon-ionization spectrum of neutral zirconium atoms using three separately-tunable pulsed visible dye lasers. Lifetimes of even-parity levels (measured with delayed-photoionization technique) range from 10 to 100 nsec. Direct ionization cross sections appear to be less than 10^{-17} cm^2; newly-detected autoionizing levels give peak ionization cross sections (inferred from saturation fluences) up to 10^{-15} cm^2. Members of Rydberg series converging to the 315 and 1323 cm^{-1} levels of Zr^+ were identified. "Clumps" of autoionizing levels are thought to be due to Rydberg-valence mixing.

2545 (UCRL-JC–112554) **Shattering the myth of the resonantly photo-pumped neon-like titanium laser.** Nilsen, J.; MacGowan, B.J.; Da Silva, L.B.; Moreno, J.C.; Koch, J.A. Lawrence Livermore National Lab., CA (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–31: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93019624. Source: OSTI; NTIS; GPO Dep.

Several years ago neon-like titanium (Z = 22) was made to lase at 326 Å on the 3p → 3s (J = 0 → 1) transition. At the time it was suggested that the lasing may be due to resonantly photo-pumping the neon-like titanium 2p → 4d lines using 3s → 2p and 3d → 2p lines in carbon-like and nitrogen-like titanium which results in lasing on the 3p → 3s transition in neon-like titanium. The strongest argument for this explanation was that adjacent elements (scandium and vanadium) did not lase while titanium was unique in having the above mentioned resonance. In addition a prepulse was required to make the titanium lase, suggestive of the formation of a low density plasma, and the plasma was very overstripped, so the above mentioned pump lines should be quite strong for photo-pumping. We have reinvestigated this laser system and will present results which show lasing on the 3p → 3s (J = 0 → 1) transition in neon-like chromium (Z = 24), iron (Z = 26), and nickel (Z = 28) at 285, 255, and 231 Å respectively. This destroys the myth of titanium being unique and makes highly unlikely that the previously mentioned photo-pumping mechanism is playing a significant role in the titanium laser. The chromium, iron, and nickel experiments all require a prepulse in order to lase and our calculations suggest that the prepulse is an exciting new way to create a uniform low density plasma when illuminating a thick slab target. This allows the proper conditions for gain and laser propagation for low Z neon-like ions and may also be applicable to other systems such as low Z nickel-like ions. We also will present experiments done on other low-Z materials and offer an explanation as to how the hyperfine effect is destroying the gain of neon-like ions with odd Z.

2546 (UCRL-JC–113549) **Coherent phase control of the photodissociation of HOD.** Allendorf, S.W. (Lawrence Livermore National Lab., CA (United States)); Conaway, W.E.; Krause, J.L. Lawrence Livermore National Lab., CA (United States). 19 Jul 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306125–5: 6. international conference on multiphoton processes, Quebec City (Canada), 25-30 Jun 1993). Order Number DE94001046. Source: OSTI; NTIS; GPO Dep.

A goal of chemical reaction dynamics is to control the course of reactions. We are examining the photodissocation of HOD, which is attractive for coherent control studies. A fixed frequency laser at 600 nm and its third harmonic at 200 nm is used to simultaneously and coherently photodissociate the rovibrationally excited parent molecules. Preliminary experiments focussed on confirming individual steps of the complex experiment; results are given of three-photon dissociation of H_2O, which gives confidence for the HOD three-photon dissociation.

2547 (UCRL-JC–114072) **Spectral characterization of lithographic sources.** Cerjan, C. Lawrence Livermore National Lab., CA (United States). Jun 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305159–8: Optical Society of America (OSA) topical meeting on soft x-ray projection lithography, Monterey, CA (United States), 10-12 May 1993). Order Number DE93019941. Source: OSTI; NTIS; GPO Dep.

Spectral data collected in recent laser-plasma experiments at LLNL for Sn are compared to simulation results in order to more fully characterize the plasma properties, especially electron temperature and density. These plasma conditions determine the ionization states achieved by the material and the consequent radiative emission. Synthetic spectra are produced using very detailed radiating line positions and oscillator strengths calculated from extensive multi-configuration Dirac-Fock computations. Better quantitative agreement with experimental conversion efficiencies in the laser intensity regime of interest to projection soft x-ray lithography is obtained using this atomic database. The spectral characterization thus validates the general reliability of the simulations.

6643 Collision Phenomena

Refer also to citation(s) 1152, 1238, 1239, 1266, 1337, 1339, 1341, 1344, 1348, 1349, 1351, 1355, 1358, 1362, 2561, 2596, 2616

2548 (BNL–48923, pp. 110-113) **State-to-state dynamics of molecular energy transfer.** Gentry, W.R. (Univ. of Minnesota, Minneapolis (United States)); Giese, C.F. Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The goal of this research program is to elucidate the elementary dynamical mechanisms of vibrational and rotational energy transfer between molecules, at a quantum-state resolved level of detail. Molecular beam techniques are used to isolate individual molecular collisions, and to control the kinetic energy of collision. Lasers are used both to prepare specific quantum states prior to collision by stimulated-emission pumping (SEP), and to measure the distribution of quantum states in the collision products by laser-induced fluorescence (LIF). The results are interpreted in terms of dynamical models, which may be cast in a classical, semiclassical or quantum mechanical framework, as appropriate.

2549 (BNL–48923, pp. 239-240) **Q-branch Raman scattering and modern kinetic thoery.** Monchick, L. (The Johns Hopkins Univ., Laurel, MD (United States)). Brookhaven National Lab., Upton, NY (United States). 1993. (CONF-9306172–: 15. combustion research contractors' meeting, Lake Harmony, PA (United States), 2-4 Jun 1993). In *Fifteenth combustion research conference.* 391p. Order Number DE93015758. Source: OSTI; NTIS; INIS.

The program is an extension of previous APL work whose general aim was to calculate line shapes of nearly resonant isolated line transitions with solutions of a popular quantum kinetic equation-the Waldmann-Snider equation-using well known advanced solution techniques developed for the classical Boltzmann equation. The advanced techniques explored have been a BGK type approximation, which is termed the Generalized Hess Method (GHM), and conversion of the collision operator to a block diagonal matrix of symmetric collision kernels which then can be approximated by discrete ordinate methods. The latter method, which is termed the Collision Kernel method (CC), is capable of the highest accuracy and has been used quite successfully for Q-branch Raman scattering. The GHM method, not quite as accurate, is applicable over a wider range of pressures and has proven quite useful.

2550 (CONF-920948–21) **Recoil ion charge state distributions in low energy Ar^{q+} – Ar collisions.** Vancura, J.; Marchetti, V.; Kostroun, V.O. Cornell Univ., Ithaca, NY (United States). Ward Lab. [1992]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13519. From 6. international conference on physics of highly charged ions; Manhattan, KS (United States); 28 Sep - 2 oct 1992. Order Number DE93040282. Source: OSTI; NTIS; INIS; GPO Dep.

We have measured the recoil ion charge state distributions in Ar^{q+} – Ar ($8 \leq q \leq 16$) collisions at 2.3 qkeV and 0.18qkeV by time of flight (TOF) spectroscopy. For Ar^{8-16+}, recoil ion charge states up to 6+ are clearly present, indicating that the 3p subshell in the target atom is being depleted, while for Ar^{10-16+}, there is evidence that target 3s electrons are also being removed. Comparison of the recoil ion charge state spectra at 2.3 and 0.18 qkeV shows that for a given projectile charge, there is very little dependence of the observed recoil target charge state distribution on projectile energy.

2551 (CONF-930711–4) **Dissociative recombination of stored and phase-spaced cooled molecular ions in CRYRING.** Larsson, M. (Royal Inst. of Tech., Stockholm (Sweden) Physics Dept.); Sundstroem, G.; Carlson, M.; Danared, H.; Kaellberg, A.; Rensfelt, K.G.; af Ugglas, M.; Brostroem, L.; Mannervik, S.; Sigray, P.; Filevich, A.; Datz, S.; Mowat, J.R. Oak Ridge National Lab., TN (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. international conference on the physics of electronic and atomic collisions; Aarhus (Denmark); 21-27 Jul 1993. Order Number DE94002459. Source: OSTI; NTIS; INIS; GPO Dep.

Ion storage rings offer several advantages for studies of recombination of molecular ions by electrons, a process which in general leads to dissociation. During the last year dissociative recombination of H_3^+, HD^+, H_2^+, D_2^+, $^3HeH^+$, $^4HeH^+$ and $^4HeD^+$ have been studied in storage rings in Stockholm, Heidelberg, Tokyo and Aarhus. Only a fraction of the results obtained at these places have been processed to the point where they have been published in the literature. Hence, the discussion of some of the results in this article must be regarded as tentative.

2552 (INIS-mf–13714, pp. 57-61) **Charged particle relaxation and radiation processes in hot dense matter.** Drska, L. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Sinor, M.; Vondrasek, J. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The physics fundamentals and some applications are described of the atomic physics subpackage of the code MIRIAM code designed for description of systems with strongly coupled atomic and macroscopic processes. The self-consistent field potential formed by ions and electrons in non-ideal plasmas at extreme conditions, obtained by SCAAM model (Drska and Sinor), was used as a basis for a theoretical and computational study of charged particle relaxation characteristics and radiation processes in hot matter. (author) 5 refs.

2553 (INIS-mf–13714, pp. 181-188) **Kinetic energy dependence of ion-molecule reaction: Recent experimental results.** Glosik, J. (Karlova Univ., Prague (Czech Republic). Fakulta Matematicko-Fyzikalni); Spanel, P.; Skalsky, V.; Smith, D.; Lindinger, W. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The reaction rate coefficient, k, was determined as a function of reactant ion/reactant neutral center-of-mass energy, E_r, for the reactions of $C_2H_2^+$ with H_2, of $C_2D_2^+$ with D_2 and of CH_3^+ with D_2 in a Selected Ion Flow Drift Tube apparatus. The reactions of $C_2H_2^+$ ($C_2D_2^+$) proceed along parallel bimolecular and thermomolecular channels producing $C_2H_3^+$ ($C_2D_3^+$) and $C_2H_4^+$ ($C_2D_4^+$); based on new experimental data, it is concluded that the reactions are slightly endothermic. For the reaction of CH_3^+ with D_2 the branching ratio between channels producing CH_2D^+ and CHD_2^+ were determined and it is concluded that the reaction is proceeding via a long-lived collision complex. (author) 6 figs., 14 refs.

2554 (INIS-mf–13731, pp. 152) **Electromagnetic dissociation study in CR39 and emulsion.** Silvia, S.M. (Istituto Nazionale di Fisica Nucleare, Torino (Italy)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DISSOCIATION/electromagnetic radiation; COULOMB FIELD; DIELECTRIC TRACK DETECTORS; DISSOCIATION; NUCLEAR EMULSIONS; PROJECTILES; SULFUR IONS

6644 Experimentally Derived Information On Atomic and Molecular Properties

Refer also to citation(s) 1260

2555 (LA-UR–93-3426) **The effect of Compton scattering on the double to single ionization ratio in helium.** Bartlett, R.J. (Los Alamos National Lab., NM (United States)); Sagurton, M.; Samson, J.A.R.; He, Z.X. Los Alamos National Lab., NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310190–1: Double ionization in He, Argonne, IL (United States), 4 Oct 1993). Order Number DE94000884. Source: OSTI; NTIS; INIS; GPO Dep.

The ratio of double to single ionization in Helium produced by photon impact has been measured for photon energies from 2.1 to 5.5 keV. The measurements suggest that a significant contribution to the single ionization cross section is caused by Compton scattering for energies greater than ~ 3.8 keV. After accounting for the ionizing Compton scattering the measured ratio is not inconsistent with recent calculations of the asymptotic limit of the ionization ratio caused by photoabsorption which predict a limit near 1.66%.

2556 (UCRL-JC–114340) **Non-adiabatic effects in low-energy electron-molecule scattering.** Rescigno, T.N. Lawrence Livermore National Lab., CA (United States). Jul 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930717–1: ICPEAC: satellite meeting on electron collision with molecules, clusters and surfaces, London (United Kingdom), 29-30 Jul 1993). Order Number DE93040485. Source: OSTI; NTIS; INIS; GPO Dep.

In this talk, I will show how the complex Kohn method which has been successfully applied to electronically elastic and inelastic electron scattering by both diatomic and polyatomic targets, can be modified to provide a computational tool for variational evaluation of the off- shell T-matrix in a completely general ab initio context. In the following section, I will give a brief outline of the theory. I will then illustrate the method by showing results we have recently obtained for vibrational excitation of both H_2 and CH_4 by low-energy electron impact.

6645 Special Atoms and Molecules

2557 (ANL-HEP-CP–93-76) **Bubble chamber measurements of cascade times in mesic atoms.** Fields, T. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930719–2: Conference on the bubble chamber and its role in particle physics, Geneva (Switzerland), 14-16 Jul 1993). Order Number DE94002218. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the pioneering role of the bubble chamber in measuring interesting atomic physics quantities such as the cascade time in mesic hydrogen and helium atoms.

2558 (INIS-mf–13714, pp. 151-157) **Iodine laser production of carbon clusters.** Laska, L. (Czeh Academy of Sciences, Prague (Czech Republic). Institute of Physics); Krasa, J.; Juha, L.; Hamplova, V.; Soukup, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology*. 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The first successful production is reported of macroscopic amounts of fullerene, prepared by vaporizing graphite with long laser pulses generated by the high-power iodine laser system Perun. The relatively high amount of fullerene produced made it possible to apply chemical extraction methods and ultraviolet absorption spectrophotometry for its detection. The experimental setup is described in detail, and the mechanism of fullerene formation is discussed. The reported experiments indicate that iodine lasers might be a more efficient tool in fullerene production than excimer lasers, despite the UV degrading of fullerene clusters. (J.U.) 4 figs., 18 refs.

2559 (JINR-D–15-92-327) **Project of the experiment to test the hypothesis on existence of 'white' and 'black' pμ-atoms.** Brudanin, V.B. (and others); Bystritskij, V.M.; Wawryscuk, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 10p. Order Number DE94606751. Source: OSTI; NTIS (US Sales Only); INIS.

This article is dedicated to the analysis of the experiment on the investigation of the muon trasfer from pμ-atom to oxygen and sulphur nuclei in the H_2+0,4%SO_2 mixture performed to Swiss group on the meson factory PSI. The conclusion of the authors of the considered article about existence of the different types of pμ-atoms ('coloured') because they didn't take into account a number of the accompanying physical processes which imitate the observed effect have doubt. With the purpose of the checking the hypothesis of the existence of 'coloured' pμ-atoms the experiment in which the influence of the accompanying processes is minimal is proposed. 15 refs.; 1 fig.

2560 (JINR-E–4-92-358) **Muon transfer rates in collisions of hydrogen isotope mesic atoms on 'bare' nuclei. Multichannel adiabatic approach.** Korobov, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Melezhik, V.S.; Ponomarev, L.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 15p. Order Number DE94606752. Source: OSTI; NTIS (US Sales Only); INIS.

A numerical scheme for solving the problem of slow collisions in the three-body adiabatic approach is applied for calculation of muon transfer rates in collisions of hydrogen isotope atoms on bare nuclei. It is demonstrated that the multichannel adiabatic approach allows one to reach high accuracy results (≈3%) estimating the cross sections of charge transfer processes which are the best ones up to date. The method is appliable in a wide range of energies (0.001-50 eV) which is of interest for analysis of muon catalysed fusion experiments. 20 refs.; 3 figs.; 5 tabs.

2561 (UNIT-F–1992-15) **Relativistic formionium production by electrons in a crystal.** Sandnes, G.I.; Olsen, H.A. Trondheim Univ. (Norway). Inst. for Fysikk. Aug 1992. 17p. Order Number DE94606753. Source: OSTI; NTIS; INIS.

The coherent production of relativistic fermionium by high energy electrons in a crystal is calculated. It is shown that considerable enhancement of the cross section occurs at certain angles and energies. 9 refs., 3 figs.

6650 Physics of Condensed Matter

Refer also to citation(s) 563, 1056, 1140, 1222, 1232, 1236, 1307, 1310, 1370, 1465, 1572, 1615, 2310, 2321

2562 (DOE/ER/45127–9) **Heavy fermion and actinide materials: Annual progress report, January 1993–February 1994.** Riseborough, P.S. Polytechnic Univ., Brooklyn, NY (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER45127. Order Number DE94002672. Source: OSTI; NTIS; INIS; GPO Dep.

During this period, properties of highly correlated systems were examined, in particular: heavy fermion semiconductors, doped oxide superconductors, and photoemission and B.I.S. spectra of cerium compounds.

2563 (LA-UR–93-3184) **Fracture simulations via massively parallel molecular dynamics.** Holian, B.L. (Los Alamos National Lab., NM (United States)); Abraham, F.F.; Ravelo, R. Los Alamos National Lab., NM (United States). 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931121–22: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE93040159. Source: OSTI; NTIS; GPO Dep.

Fracture simulations at the atomistic level have heretofore been carried out for relatively small systems of particles, typically 10,000 or less. In order to study anything approaching a macroscopic system, massively parallel molecular dynamics (MD) must be employed. In two spatial dimensions (2D), it is feasible to simulate a sample that is 0.1 μm on a side. We report on recent MD simulations of mode I crack extension under tensile loading at high strain rates. The method of uniaxial, homogeneously expanding periodic boundary conditions was employed to represent tensile stress conditions near the crack tip. The effects of strain rate, temperature, material properties (equation of state and defect energies), and system size were examined. We found that, in order to mimic a bulk sample, several tricks (in addition to expansion boundary conditions) need to be employed: (1) the sample must be pre-strained to nearly the condition at which the crack will spontaneously open; (2) to relieve the stresses at free surfaces, such as the initial notch, annealing by kinetic-energy quenching must be carried out to prevent unwanted rarefactions; (3) sound waves emitted as the

crack tip opens and dislocations emitted from the crack tip during blunting must be absorbed by special reservoir regions. The tricks described briefly in this paper will be especially important to carrying out feasible massively parallel 3D simulations via MD.

2564 (SAND–93-0887C) **A thermodynamic theory of dynamic fragmentation.** Yew, Ching H. (Texas Univ., Austin, TX (United States)); Taylor, P.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC04-76DP00789. Grant NAG9-114. (CONF-931121–18: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE93019066. Source: OSTI; NTIS; GPO Dep.

We present a theory of dynamic fragmentation of brittle materials based on thermodynamic arguments. We recover the expressions for average fragment size and number as originally derived by Grady. We extend the previous work by obtaining descriptions of fragment size distribution and compressibility change due to the fragmentation process. The size distribution is assumed to be proportional to the spectral power of the strain history and a sample distribution is presented for a fragmentation process corresponding to a constant rate strain history. The description of compressibility change should be useful in computational studies of fragmentation. These results should provide insight into the process of fragmentation of brittle materials from hypervelocity impact.

2565 (SAND–93-1391) **(BARS) – Bibliographic Retrieval System, Sandia Shock Compression (SSC) database Shock Physics Index (SPHINX): PC/DOS version 4.0.** Herrmann, W. (Sandia National Labs., Albuquerque, NM (United States)); Parker, T.J.; Mulholland, K. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001679. Source: OSTI; NTIS; GPO Dep.

The Bibliographic Retrieval System (BARS) is a database management system specially designed to retrieve bibliographic references. Two databases are available, (i) the Sandia Shock Compression (SSC) database which contains over 5600 references to the literature related to stress waves in solids and their applications, and (ii) the Shock Physics Index (SPHINX) which includes over 6200 further references to stress waves in solids, material properties at intermediate and low rates, ballistic and hypervelocity impact, and explosive or shock fabrication methods. There is some overlap in the information in the two data bases.

2566 (SAND–93-1400C) **Bridgman's concern.** Graham, R.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-930676–51: 14. international conference of the International Association for the Advancement of High Pressure Science and Technology, Colorado Springs, CO (United States), 27 Jun - 2 jul 1993). Order Number DE93040900. Source: OSTI; NTIS; INIS; GPO Dep.

In 1956 P.W. Bridgman published a letter to the editor in the Journal of Applied Physics reporting results of electrical resistance measurements on iron under static high pressure. The work was undertaken to verify the existence of a polymorphic phase transition at 130 kbar (13 GPa) reported in the same journal and year by the Los Alamos authors, Bancroft, Peterson and Minshall for high pressure, shock-compression loading. In his letter, Bridgman reported that he failed to find any evidence for the transition. Further, he raised some fundamental concerns as to the state of knowledge of shock-compression processes in solids. Later it was determined that Bridgman's static pressure scale was in error, and the shock observations became the basis for calibration of pressure values in static high pressure apparatuses. In spite of the error in pressure scales, Bridgman's concerns on descriptions of shock-compression processes were perceptive and have provided the basis for subsequent fundamental studies of shock-compressed solids. The present paper, written in response to receipt of the 1993 American Physical Society Shock-Compression Science Award, provides a brief contemporary assessment of those shock-compression issues which were the basis of Bridgman's 1956 concerns.

2567 (SAND–93-1422-Vol.1) **(BARS) – Bibliographic Retrieval System Sandia Shock Compression (SSC) database Shock Physics Index (SPHINX) database: Volume 1: UNIX version query guide customized application for INGRES.** Herrmann, W. (Sandia National Labs., Albuquerque, NM (United States)); von Laven, G.M.; Parker, T. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001703. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.

The Bibliographic Retrieval System (BARS) is a data base management system specially designed to retrieve bibliographic references. Two databases are available, (i) the Sandia Shock Compression (SSC) database which contains over 5700 references to the literature related to stress waves in solids and their applications, and (ii) the Shock Physics Index (SPHINX) which includes over 8000 further references to stress waves in solids, material properties at intermediate and low rates, ballistic and hypervelocity impact, and explosive or shock fabrication methods. There is some overlap in the information in the two data bases.

2568 (SAND–93-1422-Vol.2) **(BARS): Bibliographic Retrieval System, Sandia Shock Compression (SSC) database, Shock Physics Index (SPHINX) database: Volume 2: UNIX version user's guide.** von Laven, G.M. (Advanced Software Engineering, Madison, AL (United States)); Herrmann, W. Sandia National Labs., Albuquerque, NM (United States). Sep 1993. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94001704. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.

The Bibliographic Retrieval System (BARS) is a database management system specially designed to store and retrieve bibliographic references and track documents. The system uses INGRES to manage this database and user interface. It use forms for journal articles, books, conference proceedings, theses, technical reports, letters, memos, visual aids, as well as a miscellaneous form which can be used for data sets or any other material which can be assigned an access or file number. Sorted output resulting from flexible BOOLEAN searches can be printed or saved in files which can be inserted in reference lists for use with word processors.

2569 (SAND–93-1927C) **Simple method to estimate MOS oxide-trap, interface-trap, and border-trap densities.** Fleetwood, D.M.; Shaneyfelt, M.R.; Schwank, J.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931226–1: Institute of Electrical and Electronics Engineers (IEEE) semiconductor interface specialists conference, Ft. Lauderdale, FL (United States), 9-11 Dec 1993). Order Number DE93041138. Source: OSTI; NTIS; GPO Dep.

Recent work has shown that near-interfacial oxide traps that communicates with the underlaying Si ("border traps") can play a significant role in determining MOS radiation response and long-term reliability. Thermally-stimulated-current 1/f noise, and frequency-dependent charge-pumping measurements have been used to estimate border-trap densities in MOS structures. These methods all require high-precision, low-noise measurements that are often difficult to perform and interpret. In this summary, we describe a new dual-transistor method to separate bulk-oxide-trap, interface-trap, and border-trap densities in irradiated MOS transistors that requires only standard threshold-voltage and high-frequency charge-pumping measurements.

2570 (SLAC-PUB–5298) **Photoluminescence of $ZnGe_{0.68}Si_{0.32}As_2$.** Kimmel, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jan 1991. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-900924–17: 9. international symposium on high energy spin-physics, Bonn (Germany), 10-15 Sep 1990). Order Number DE93040937. Source: OSTI; NTIS; INIS; GPO Dep.

A $ZnGe_{0.68}Si_{0.32}As_2$ layer epitaxially grown on GaAs was investigated for polarized photoluminescence. The luminescence peaks found around 1.5 eV were attributed to the GaAs substrate. Within our detection limits and with 2.4 eV excitation we could not detect

photoluminescence in the energy range between 1.4 and 2.3 eV from the layer. The luminescence characteristics of the layer sample were the same as for the GaAs reference sample except for a small shift of the low energy peak towards higher energies at temperature below 30 K. The luminescence polarization as a function of the excitation energy agrees with the curve found for the reference GaAs samples. The maximum luminescence polarization of 25% is not exceeded. The absorption behavior of the layer indicated an indirect bandgap at approximately 1.55 eV at 10 K. An indirect bandgap can account for the absence of luminescence, however such material is not suitable for an efficient spin polarized electron cathode.

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Refer also to citation(s) 1013, 1102, 1509, 2196

2571 (ANL/APS/CP–5) **Proceedings of the Fifth Users Meeting for the Advanced Photon Source.** Argonne National Lab., IL (United States). Dec 1992. 335p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9210290–: 5. users meeting for the Advanced Photon Source (APS), Argonne, IL (United States), 14-15 Oct 1992). Order Number DE93040692. Source: OSTI; NTIS; INIS; GPO Dep.

The Fifth Users Meeting for the Advanced Photon Source (APS) was held on October 14–15, 1992, at Argonne National Laboratory. Scientists and engineers from universities, industry, and national laboratories came to review the status of the facility and to look ahead to the types of forefront science that will be possible when the APS is completed. The presentations at the meeting included an overview of the project, funding opportunities, advances in synchrotron radiation applications, and technical developments at the APS. In addition, the 15 Collaborative Access Teams that have been approved to date participated in a poster session, and several vendors displayed their wares. The actions taken at the 1992 Business Meeting of the Advanced Photon Source Users Organization are also documented.

2572 (ANL/XFD/CP–79184) **Nuclear resonant scattering beamline at the Advanced Photon Source.** Alp, E.E.; Mooney, T.M.; Toellner, T.; Sturhahn, W. Argonne National Lab., IL (United States). Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930816–3: International conference on the applications of the Moessbauer effect, Vancouver (Canada), 8-14 Aug 1993). Order Number DE94001439. Source: OSTI; NTIS; INIS; GPO Dep.

The principal and engineering aspects of a dedicated synchrotron radiation beamline under construction at the Advanced Photon Source for nuclear resonant scattering purposes are explained. The expected performance in terms of isotopes to be studied, flux, and timing properties is discussed.

2573 (INIS-BR–3174, pp. 99-114) **Data analysis of a polycrystal nickel sample obtained by use of neutron diffraction.** Parente, C.B.R.; Mazzocchi, V.L.; Araujo Kaschny, J.R. de; Costa, M.S. da; Rizzo, P.; Campos, W.M.S. Sociedade Brasileira de Fisica, Sao Paulo, SP (Brazil). 1990. 131p. (In Portuguese). (CONF-9002161–: 4. Jorge Andre Swieca summer school, Sao Paulo (Brazil), 5-16 Feb 1990). In *Proceedings of the Jorge Andre Swieca Summer School; 4. Experimental Nuclear Physics Session.* Order Number DE94604022. Source: OSTI; NTIS (US Sales Only); INIS.

A non-sophisticated analysis of the nickel structure was performed. Neutron diffraction data obtained using polycrystalline nickel were utilized. (L.C.J.A.).

2574 (INIS-mf–13731, pp. 178) **Radon diffusion through thin plastics.** Chavez, A. (Inst. Nal. de Inv. Nucleares, (Mexico)); Balcazar, M.; Cervantes, B. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC POLYMERS/thin films; RADON/diffusion; RADON/thin films; CONCENTRATION RATIO; DIFFUSION CHAMBERS; POLYETHYLENES; RADON; DIFFUSION; SURFACE BARRIER DETECTORS

2575 (INIS-mf–13731, pp. 212) **Use of particle tracks to study metastable materials.** Russell, F.M. (Dept. of Phys., Beijing Univ., Beijing (China)). Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METASTABLE STATES/materials; METASTABLE STATES/particle tracks; CRYSTAL LATTICES; DISTURBANCES; MATERIALS; MUSCOVITE; PHASE TRANSFORMATIONS; POSITRONS; POTENTIAL ENERGY; SOLITONS

2576 (INIS-mf–13731, pp. 213) **Permeation of test gases through nuclear tracks in plastics.** Ruehmann, A. (Institut fuer Reine und Angewandte Kernphysik Christian-Albrechts-Universitaet Kiel (Germany)); Enge, W. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GASES/organic polymers; GASES/permeability; ARGON; CARBON DIOXIDE; DIELECTRIC TRACK DETECTORS; GASES; PERMEABILITY; GOLD IONS; IRRADIATION; MASS SPECTROMETERS; NITROGEN; TIME MEASUREMENT

2577 (JINR-R–14-92-400) **Temperature and field dependencies of neutron scattering intensity at coherent spin-flop transition in Cr_2O_3.** Georgiev, D.; Nitts, V.V.; Sirotin, A.P.; Yakovlev, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 6p. (In Russian). Order Number DE94606850. Source: OSTI; NTIS (US Sales Only); INIS.

The results of experimental investigation of the character of a coherent spin-flop phase transition in a collinear antiferromagnetic Cr_2O_3 are presented. The phase transition was being induced by the magnetic field pulses of about 1 msec. The change of orientation of sublattices magnetizations was determined by the measurement of the intensity of the peak (224) with time resolution of about 10 mks. The measurements are carried out on the SNIM-2 spectrometer at the IBR-2 pulsed reactor. 5 refs.; 5 figs.

2578 (JINR-R–14-92-401) **Hysteresis phenomena at spin-flop transition induced by the pulsed magnetic field.** Georgiev, D.; Nitts, V.V.; Sirotin, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 8p. (In Russian). Order Number DE94606851. Source: OSTI; NTIS (US Sales Only); INIS.

The experimental results of neutron diffraction on single crystals of Cr_2O_3 and α-Fe_2O_3 in which spin-flop transition is induced by the pulsed magnetic field are presented. The dynamic hysteresis arises in the measurements of the dependence of neutron scattering intensity on a field value; it is connected with the fact that the process of reaching equilibrium for sublattices magnetisations lags behind the change of the magnetic field. At a relatively high amplitude of field pulses, providing high rate of change of the field at phase transition, the hysteresis loop takes a limiting value and form. The dependences of phase reorientation on sample temperature correspond to the distinctions of phase diagrams of these substances. 4 refs.; 6 figs.

2579 (JINR-R–14-92-579) **Atomic and magnetic structure of $YBa_2(Cu_{1-x}Fe_x)_3O_{6+y}$ at $0.05 \leq x \leq 0.30$, $y \simeq 1$ and $y \simeq 0.5$.** Balagurov, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Lyubutin, I.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 24p. (In Russian). Order Number DE94606852. Source: OSTI; NTIS (US Sales Only); INIS.

The system $YBa_2(Cu_{1-x}Fe_x)_3O_{6+y}$ was studied by neutron diffraction and Mossbauer spectroscopy in the wide interval of iron

concentration, $0.05 \leq x \leq 0.30$, in both oxygen saturated, $y \simeq 1$, and oxygen deficient, $y \simeq 0.5$, compositions. The very detailed data about the atomic structure and magnetic state were obtained for all the samples and compared with the Y123-Cu/Co system. A marked difference in magnetic phase diagrams of Fe and Co systems was established. 30 refs.; 15 figs.; 3 tabs.

2580 (JINR-R–17-92-402) **Kinetics of coherent spin-flop transition in antiferromagnetic with uniaxial anisotropy.** Nitts, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 14p. (In Russian). Order Number DE94606853. Source: OSTI; NTIS (US Sales Only); INIS.

A monodomain antiferromagnetic in the magnetic field oriented along the anisotropy axis is considered. Three models of antiferromagnetic behaviour are analysed consecutively. In the first model oscillations of the crystal magnetic system without dissipation of the energy are considered. In the second one the case of spin-flop transition with the energy dissipation at an isothermal approximation is investigated. In the third model the analysis of antiferromagnetic behaviour in the pulsed magnetic fields is proposed taking into account the fact that the process of the sublattices reorientation is adiabatic. Probably such consideration will allow one to explain the known experimental data on the spin-flop transition in single crystals of Cr_2O_3 and α-Fe_2O_3 by the existence of an adiabatic state which prevents from a quick overturn of sublattices at an increase of the magnetic field. 6 refs.; 1 fig.

2581 (LA–12647-PR) **The Manuel Lujan, Jr. Neutron Scattering Center (LANSCE) experiment reports 1992 run cycle: Progress report.** DiStravolo, M.A. (comp.). Los Alamos National Lab., NM (United States). Sep 1993. 214p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001885. Source: OSTI; NTIS; INIS; GPO Dep.

This year was the fifth in which LANSCE ran a formal user program. A call for proposals was issued before the scheduled run cycles, and experiment proposals were submitted by scientists from universities, industry, and other research facilities around the world. An external program advisory committee, which LANSCE shares with the Intense Pulsed Neutron Source (IPNS), Argonne National Laboratory, examined the proposals and made recommendations. At LANSCE, neutrons are produced by spallation when a pulsed, 800-MeV proton beam impinges on a tungsten target. The proton pulses are provided by the Clinton P. Anderson Meson Physics Facility (LAMPF) accelerator and an associated Proton Storage Ring (PSR), which can alter the intensity, time structure, and repetition rate of the pulses. The LAMPF protons of Line D are shared between the LANSCE target and the Weapons Neutron Research (WNR) facility, which results in LANSCE spectrometers being available to external users for unclassified research about 80% of each annual LAMPF run cycle. Measurements of interest to the Los Alamos National Laboratory may also be performed and may occupy up to an additional 20% of the available beam time. These experiments are reviewed by an internal program advisory committee. One hundred sixty-seven proposals were submitted for unclassified research and twelve proposals for research of a programmatic interest to the Laboratory; six experiments in support of the LANSCE research program were accomplished during the discretionary periods. Oversubscription for instrument beam time by a factor of three was evident with 839 total days requested and only 371 available for allocation.

2582 (STF–19A93007) **A dislocation study in an icosahedral quasicrystal.** Guo, Y.X.; Andersen, S.J. Stiftelsen for Industriell og Teknisk Forskning (SINTEF), Trondheim (Norway). Mar 1993. 16p. Order Number DE94606854. Source: OSTI; NTIS; INIS.

A method for determining Burgers vectors of dislocations in icosahedral quasicrystals has been developed. It is based on high resolution electron micrographs and theoretical calculations using the theory behind the cut and projection method. The procedure suggested can be applied to dislocations imaged along five-fold axes. With this method a Burgers vector of the type b=[0110-20] has been determined in six dimensional space. 22 refs., 2 figs.

2583 (UCRL-JC–112793) **IMAP: A complete Ion Micro-Analysis Package for the nuclear microprobe.** Antolak, A.J. (Sandia National Labs., Livermore, CA (United States)); Hildner, M.L.; Morse, D.H.; Bench, G.S. Lawrence Livermore National Lab., CA (United States). 7 Jun 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930709–2: 11. international conference on ion beam analysis, Balatonfured (Hungary), 5-9 Jul 1993). Order Number DE94000387. Source: OSTI; NTIS; INIS; GPO Dep.

Microprobe techniques using scanned, focused MeV ions are routinely used in Livermore for materials characterization. Comprehensive data analysis with these techniques is accomplished with the computer software package IMAP, for Ion Micro-Analysis Package. IMAP consists of a set of command language procedures for data processing and quantitative spectral analysis. Deconvolution of the data is achieved by spawning sub-processes within IMAP which execute analysis codes for each specific microprobe technique. IMAP is structured to rapidly analyze individual spectra or multi-dimensional data blocks which classify individual events by the two scanning dimensions, the energy of the detected radiation and, when necessary, one sample rotation dimension. Several examples are presented to demonstrate the utility of the package.

2584 (UCRL-JC–113254) **Analysis of a proposed Compton backscatter imaging technique.** Hall, J.; Jacoby, B. Lawrence Livermore National Lab., CA (United States). Dec 1992. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310164–3: International symposium on substance identification technologies, Innsbruck (Austria), 4-8 Oct 1993). Order Number DE93040537. Source: OSTI; NTIS; GPO Dep.

Imaging techniques which require access to only one side of the object being viewed are potentially useful in situations where conventional projection radiography and tomography cannot be applied, such as looking for voids in a large container where access to the back of the object is inconvenient or even impossible. One-sided imaging techniques are currently being used in nondestructive evaluation of surfaces and shallow subsurface structures. In this work we present both analytical calculations and detailed Monte Carlo simulations aimed at assessing the capability of a proposed Compton backscatter imaging technique designed to detect and characterize voids located several centimeters below the surface of a solid. The proposed technique, based on a scheme suggested by Farmer and Collins, encodes the spatial position and structure of voids in a solid in the energy spectrum of the Compton-scattered photons as recorded by a high resolution detector. Our calculations model a ^{137}Cs source projecting a 1 mm^2 pencil beam of 662 keV gammas into a target slab at an incident angle of 45° and a collimated detector (also oriented at 45° with respect to the surface) which views the beam path at a central angle of 90°. The detector collimator is modeled here as a triangular slit viewing a 2.54 cm (1.000") segment of the beam path at a depth of 2 cm below the surface of the slab. Our results suggest that the proposed technique should be capable of an absolute position resolution of $\approx$ 0.25 mm ($\approx$ 0.010") for isolated voids and an overall object resolution of $\approx$ 1.00 lp/mm ($\approx$ 0.04"). The predicted signal contrast for voids packed with various contraband materials will be discussed as well as multiple scattering contributions to the predicted yields.

2585 (UCRL-JC–114285) **Energy-resolving x-ray detectors with charge amplification due to multiple quasiparticle tunneling.** Mears, C.A. (Lawrence Livermore National Lab., CA (United States)); Labov, S.E.; Barfknecht, A.T. Lawrence Livermore National Lab., CA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ;FG02-91ER81190. (CONF-930863–1: International superconductive electronic conference, Boulder, CO (United States), 11-14 Aug 1993). Order Number DE93019506. Source: OSTI; NTIS; GPO Dep.

Short communication. X-RAY DETECTION/energy resolution; SEMICONDUCTOR MATERIALS/x-ray detection; X-RAY EQUIPMENT; TUNNEL EFFECT; QUASI PARTICLES

2586 (UCRL-JC–114718) **PIXEF: The Livermore PIXE spectrum analysis package.** Antolak, A.J. (Sandia National Labs., Livermore, CA (United States)); Bench, G.S. Lawrence Livermore National Lab., CA (United States); Sandia National Labs., Livermore, CA (United States). Jul 1993. 17p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract W-7405-ENG-48 ;AC04-76DP00789. (CONF-930712–6: ICACS: 15. international conference on atomic collision in solids, London (Canada), 26-30 Jul 1993). Order Number DE94000405. Source: OSTI; NTIS; GPO Dep.

PIXEF (for, PIXE-Fit) is a proton-induced x-ray emission (PIXE) data analysis program designed for analyzing medium to heavy element matrices while retaining the capability to treat lower atomic number targets. Using nonlinear least squares fitting techniques, algorithms have been developed or modified both for fitting the characteristic x-ray peaks and representing the associated bremsstrahung and γ-ray background. Self-absorption and secondary fluorescence are explicitly determined for K shell and L subshell x rays. Data bases have been created or improved, where necessary, from reliable current literature values or by direct measurement for element mass attenuation coefficients, photoionization and proton ionization cross sections, Coster-Kronig transition probabilities, fluorescence yields, and relative line intensities. The utility of the program is demonstrated with PDM spectra obtained at Livermore.

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2587 (CNIC–00653) **ZnO thin films with c-axis orientation prepared on the room temperature substrate by the ECR multipolar plasma sputtering method.** Ning Zhaoyuan (Academia Sinica, Hefei, AH (China). Inst. of Plasma Physics); Zhang Yanling; Ren Zhaoxing; Xiao Yujin; Li Xiangqun. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 11p. (ASIPP–0035.). Order Number DE94605039. Source: OSTI; NTIS (US Sales Only); INIS.

Zinc oxide (ZnO) films with c-axis orientation have been prepared on the room temperature substrates by a reactive sputtering deposition utilizing electron-cyclotron-resonance multipolar (ECRM) plasma apparatus built with Nd-Fe-B magnets and 2.45 GHz, TE_{10} mode microwave. The plasma distributions in the axial direction were found to be sensitive to the magnetic field configurations in the plasma cavity. The XRD, TEM, SEM analyses indicated that the deposited ZnO films were of nanometre size, smoothness and dense with high c-axis orientation.

2588 (ENEA-RT-INN–92-42) **Investigation of laser-CVD process through on-line optical diagnistics and in-situ surface sensitive analysis techniques.** Borsella, E. (ENEA, Frascati (Italy). Dipt. Sviluppo Tecnologie di Punta); Larciprete, R.; Nesterenko, A. Jan 1993. 24p. (CONF-9209415–1: 1992 international conference on advaced and laser technologies, Moscow (Russian Federation), 8-11 Sep 1992; RT/INN–92-42). Order Number DE94716574. Source: OSTI; NTIS (US Sales Only).

Excimer lasers have been widely used in recent years to induce chemical vapor deposition (L-CVD) of thin films from volatile organometallic molecules. The purpose of this paper is to correlate the mechanism of photo-induced ligand removal in the laser photolysis of organometallic compounds with film composition and growth. ArF laser irradiated TMT (tetramethyltin) was used as a model system. On-line optical diagnostics were employed to investigate the effect of ArF laser fluence and buffer gas (Ar, N_2, O_2) addition on the photodissociation of TMT. In-situ Auger analysis permitted the researchers to determine the composition of the films deposited by ArF laser irradiation of TMT in the vicinity of a substrate and to investigate the progressive oxidation of the tin films consequent to dilution of TMT in oxygen. It was found that incomplete elimination of organic radicals in the UV photolysis of TMT causes the presence of C in the photodeposited tin films. O_2 is effective in promoting Sn film oxidation and in eliminating carbon contamination through a chemical reaction with ligand carrying photo-fragments followed by the formation of volatile organic compounds and stable Sn-O bonds.

6653 Interactions Between Beams and Condensed Matter

Refer also to citation(s) 994, 1010, 1116, 1278, 2521, 2581

2589 (ANL/CHM/CP–80916) **Sputtering of neutral and ionic indium clusters.** Ma, Z.; Coon, S.R.; Calaway, W.F.; Pellin, M.J.; Gruen, D.M.; Von Nagy-Felsobuki, E.I. Argonne National Lab., IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9311104–3: 40. national symposium of the American Vacuum Society (AVS), Orlando, FL (United States), 15-19 Nov 1993). Order Number DE94001277. Source: OSTI; NTIS; INIS; GPO Dep.

Secondary neutral and secondary ion cluster yields were measured during the sputtering of a polycrystalline indium surface by normally incident ~4 keV Ar^+ ions. In the secondary neutral mass spectra, indium clusters as large as In_{32} were observed. In the secondary ion mass spectra, indium clusters up to In_{18}^+ were recorded. Cluster yields obtained from both the neutral and ion channel exhibited a power law dependence on the number of constituent atoms, n, in the cluster, with the exponents measured to be −5.6 and −4. 1, respectively. An abundance drop was observed at n=8, 15, and 16 in both the neutral and ion yield distributions suggesting that the stability of the ion (either secondary ion or photoion) plays a significant role in the observed distributions. In addition, our experiments suggest that unimolecular decomposition of the neutral cluster may also plays an important role in the measured yield distributions.

2590 (CONF-930711–1) **Electron spectroscopic studies of the neutralization of slow multicharged ions during interactions with a metal surface.** Meyer, F.W.; Folkerts, L.; Havener, C.C.; Hughes, I.G.; Overbury, S.H.; Zehner, D.M.; Zeijlmans van Emmichoven, P.A. Oak Ridge National Lab., TN (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. international conference on the physics of electronic and atomic collisions; Aarhus (Denmark); 21-27 Jul 1993. Order Number DE93041046. Source: OSTI; NTIS; INIS; GPO Dep.

Recent experimental results of electron spectroscopic studies of the neutralization and relaxation of slow multicharged ions interacting with metal surfaces are summarized. Discussed are measurements of projectile K-Auger electron emission during interactions of N^{6+} ions with clean and cesiated Au, as well as clean Cu single crystal targets. While the dominant component in the measured K-Auger spectra is shown to be due to sub-surface electron emission, at incident perpendicular velocities below about 10^{-2} au, small features become evident in the measured K-Auger spectra that are consistent with above surface projectile electron emission. Experimental results are compared with results of modelling studies of above- and sub-surface electron emission. Also presented are measurements of low energy electron emission during multicharged ion-surface interactions, together with a discussion and analysis of the various contributing low energy emission mechanisms.

2591 (INIS-mf–13731, pp. 76) **Influence of the irradiation temperature and of the crystallographic structure on track formation in metallic compounds.** Barbu, A. (Ecole Polytechnique, 91 - Palaiseau (France)); Dunlop, A.; Lesueur, D.; Jaskierowicz, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METALS/particle tracks; PARTICLE TRACKS/crystal structure; PARTICLE TRACKS/temperature dependence; AMORPHOUS STATE; CRYSTALLOGRAPHY; ELECTRONS; EXCITATION; IONS; IRRADIATION; LATENT IMAGES; METALS

2592 (INIS-mf–13731, pp. 150) **Recovery stages of heavy ions induced damage in crystalline minerals.** Singh, L. (Dept. of Physics, Guru Nanak Dev Univ. (India)); Singh, J.; Singh, S.; Virk, H.S. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY IONS/minerals; HEAVY IONS/radiation effects; ANNEALING; CRYSTALLINE LENS; ETCHING; MINERALS; TEMPERATURE DEPENDENCE

2593 (INIS-mf–13731, pp. 215) **Mean ranges of ^{209}Bi ions in ZnP-glass detector.** Dwivedi, K.K. (Dept. of Chemistry, North-Eastern Hill Univ., Shillong (India)); Kocsis, Zs.; Vater, P.; Brandt, R. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH 209/dielectric track detectors; BISMUTH 209/range; DIELECTRIC TRACK DETECTORS/glass; DIELECTRIC TRACK DETECTORS/zinc phosphides; BISMUTH IONS; RANGE; GLASS; ETCHING

2594 (JAERI-M–93-152) **Stopping power of charged particles from 10 eV/amu to 10 GeV/amu.** Nakane, Yoshihiro (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Tanaka, Shun-ichi; Furihata, Shiori; Iwai, Satoshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Aug 1993. 183p. (In Japanese). Order Number DE94719024. Source: OSTI; NTIS; INIS.

Electric collision, nuclear collision and total stopping powers in 10 kinds of elements: H_2, He, Be, C, Al, Fe, Cu, W, Pb and U, and 4 kinds of materials: water, phantom, LiF-TLD and SSNTD (solid state neutron track detector) have been calculated for 10 kinds of charged particles from 10 eV/amu to 10 GeV/amu with STOPPING, SPAR, and RSTAN/RSHEV codes, in which the charged particles are important projectiles for evaluating the dose and detector responses of radiations, and for accelerator shielding calculations. Calculated data are presented in Table and Figure. (author).

2595 (JINR-R–14-92-396) **Ion channeling peculiarities in $YBa_2Cu_3O_7$ monocrystal.** Borovik, A.S. (Rostovskij-na-Donu Gosudarstvennyj Univ., Rostov-na-Donu (Russian Federation). Nauchno-Issledovatel'skij Inst. Fiziki); Epifanov, A.A.; Malyshevskij, V.S.; Korneev, D.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 18p. (In Russian). Order Number DE94606885. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Fiz. Tverd. Tela.

The approach was developed in the frame of diffusion model. It permits to describe the fast light ions channeling process for near-surface region of multicomponent low-symmetry crystals. Theoretical analysis carried out in the paper for channeling in a thin-film monocrystal $YBa_2Cu_3O_7$ showed, that the given structure has peculiarities of angle dependent yield of scattered ions which is not specific for one-component crystals. Developed approach permits to increase essentially the abilities of an experimental data interpretation, the aim of which is to extract details of the depth dependence of structural and dynamical properties of a thin monocrystal film YBaCuO. 11 refs.; 5 figs.

2596 (LA-UR–93-2790) **Interactions of slow H, H_2 and H_3 with thin foils.** Funsten, H.O.; Barraclough, B.L.; McComas, D.J. Los Alamos National Lab., NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930712–5: ICACS: 15. international conference on atomic collision in solids, London (Canada), 26-30 Jul 1993). Order Number DE93040263. Source: OSTI; NTIS; INIS; GPO Dep.

Interaction processes resulting from the transit of incident 2-30 key H^+, H_2 and H_3^+ through 1.2 to 2.5 $\mu g\ cm^{-2}$ carbon foils are investigated by examining the charge state and angular scatter distributions of atomic and molecular species that exit the foils. A comparison of the scatter distributions of exiting H_2^+ and H^o show that H fragments from the same incident molecule that recombine to form H_2 after transiting a foil scatter independently (i.e., not as a molecule) from foil atoms. The measured fractions of H_2^+ from incident H_2^+ and H_3^+ are found to be dependent on the angular scatter half-width, but expected enhancements of this fraction for incident H_3^+, due to the presence of an additional proton, are not observed within the experimental error. However, the observed fraction of H^o is enhanced by approximately 2% for incident H_2^+ and 4% for H_3^+ relative to that observed using incident protons. This is evidence for a proximity effect at the exit surface of the foil in which the electron capture probability by one proton is enhanced by another proton in close proximity.

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Refer also to citation(s) 988, 1076, 1079, 1089, 2828, 2846

2597 (ANL/CHM/PP–77001) **Conductors with small Fermi energies and small gap energies.** Thorn, R.J. Argonne National Lab., IL (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040887. Source: OSTI; NTIS; INIS; GPO Dep.

If the Fermi energy is of the order of meV's, the usual treatment of the density of free electrons is not valid, but use can be made of an averaged density of states that depends weakly on temperature, so that the temperature variation of the conductivity can be expressed by the equation: $\sigma \cong CT^{(1-s)}\ 1n\{[(\exp(\beta E_f) + 1)/2][\exp(-\beta(E_g - E_f)) + 1)]\}$ in which E_f is the Fermi energy, E_g is the top of the energy gap for thermal activation, s is the exponent of the temperature-dependent scattering. This equation serves to define a class of solids consisting of a microcomposite with a narrow conduction band for which E_f of the order of ceV's or less and a thermal activated conduction for which E_g is of the order of ceV's. It describes quantitatively the conductivity, $\sigma(T;\Delta$, for $YBa_2Cu_3O_{7-\Delta}$ and $\sigma(T;p)$ as the hydrostatic pressure p is varied for κ-$(BEDT\text{-}TTF)_2CuN(CN)_2Br$.

2598 (ANL/ET/CP–78724) **Processing of YBCO superconductors for improved levitation force.** Balachandran, U.; Zhong, W. Argonne National Lab., IL (United States). May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931103–4: Joint MMIJ/TMS international conference on processing materials for properties, Honolulu, HI (United States), 7-10 Nov 1993). Order Number DE94001326. Source: OSTI; NTIS; GPO Dep.

One objective of the ANL superconductor program is to develop improved processing methods for production of YBCO superconductors with higher levitation forces suitable for low-friction, superconductor/permanent-magnet bearings and flywheel-energy-storage applications. From the standpoint of these applications, melt-processed bulk YBCO superconductors are of considerable interest. Levitation force and flux-pinning properties depend on microstructural features of the superconductors. We have added several chemical species to YBCO to alter the microstructure and have used a seeding technique to induce crystallization during melt processing. In this paper, we discuss the effects of various process parameters, additives, and a seeding technique on the properties of melt-processed bulk YBCO samples and compare the results with solid-state-sintered superconductors.

2599 (ANL/MCT/CP–78916) **Design of microchannels for cryostabilization of high temperature superconducting magnets.** Cha, Y.S.; Hull, J.R.; Niemann, R.C. Argonne National Lab., IL (United States). [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931121–28: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94001324. Source: OSTI; NTIS; GPO Dep.

Microchannel cooling using subcooled liquid nitrogen is proposed to cryogenically stabilize high-temperature superconducting magnets. Various design constraints and parameters are identified and summarized. A graphical method is proposed for the design of microchannel systems. This graphical method helps to reduce the amount of work towards achieving optimum design for a specific application because there are a large number of parameters involved in the design of a microchannel system. The proposed graphical method are illustrated by three examples. The results show that a design window may appear for a given application. Any point within this window is an acceptable design. Another advantage of the graphical method is that, by selecting a design point, the design margin against various design contrains can be easily identified. Any two of the design variables can be selected as the independent variables. The choice depends on specific application and, to a certain extent, on individual preference. The three examples revealed that, for high current density applications,

the most scattering constraints are the coolant temperature rise and the fin tip temperatures provided that a moderate pressure drop can be tolerated.

2600 (ANL/MCT/CP–80158) **Heavy ion irradiation of Bi-2223 silver-clad tapes for superconducting current density enhancement.** Malozcnoff, A.P. (American Superconductor Corp., Westborough, MA (United States)); Carter, W.L.; Riley, G.N. Jr.; Wheeler, R. IV; Kirk, M.A.; Civale, L.; Marwick, A.D. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930703–9: International cryogenic engineering conference and international cryogenic materials conference, Albuquerque, NM (United States), 12-16 Jul 1993). Order Number DE93017416. Source: OSTI; NTIS; GPO Dep.

Silver-clad composite tapes of Bi(Pb)SrCaCuO-2223 were irradiated with 1 GeV Au^{23+} ions perpendicular to the tape plane, creating columnar tracks with 10 nm diameter. Detailed transmission electron microscopy shows continuous columns, but with variations in the track thickness of +/−2 nm. Magnetic hystersis measurements show substantial enhancement of superconducting current density at most temperatures and fields. Granular and nongranular models for the origin of the magnetic signals are discussed. The results indicate the potential for further performance improvement in high temperature superconducting wire technology, as well as limits in the high-field performance at 77 K.

2601 (CONF-9302137–2) **Simulating the Euclidean time Schroedinger equations using an Intel iPSC/860 hypercube: Application to the t-J model of high-$T_c$superconductivity.** Kovarik, M.D. (Oak Ridge National Lab., TN (United States)); Barnes, T. Oak Ridge National Lab., TN (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. annual workshop on recent developments in computer simulation studies in condensed matter physics; Athens, GA (United States); 22-26 Feb 1993. Order Number DE94000489. Source: OSTI; NTIS; INIS; GPO Dep.

We describe a Monte Carlo simulation of a dynamical fermion problem in two spatial dimensions on an Intel iPSC/860 hypercube. The problem studied is the determination of the dispersion relation of a dynamical hole in the t-J model of the high temperature superconductors. Since this problem involves the motion of many fermions in more than one spatial dimensions, it is representative of the class of systems that suffer from the "minus sign problem" of dynamical fermions which has made Monte Carlo simulation very difficult. We demonstrate that for small values of the hole hopping parameter one can extract the entire hole dispersion relation using the GRW Monte Carlo algorithm, which is a simulation of the Euclidean time Schroedinger equation, and present results on 4 x 4 and 6 x 6 lattices. Generalization to physical hopping parameter values wig only require use of an improved trial wavefunction for importance sampling.

2602 (CONF-9304191–2) **Spin-polaron theory of high-$T_c$superconductivity: 3, Gap function and critical temperature.** Wood, R.F. Oak Ridge National Lab., TN (United States). Jun 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on high-T_c superconductivity and its applications; Cairo (Egypt); 4-16 Apr 1993. Order Number DE93019198. Source: OSTI; NTIS; INIS; GPO Dep.

Results from previous papers in this series are used to derive approximate expressions for the gap and $T_c$within the framework of a Cooper-pairing approach. The possible symmetry types of the gap are discussed. It is shown how the proximity of the Fermi level to the Mott-Hubbard band edge and the interplay of O $2p\sigma$ and $2p\pi$ bands and/or localization effects can provide good fits to the variation of $T_c$with x in $La_{2-x}Sr_xCuO_4$ and $YBa_2Cu_3O_{7-x}$. It is concluded that the in-plane gap is either s- or d-like but anisotropic in either case. Other aspects and implications of the model and of the calculations are given and comparisons with Mott's spin-bipolaron model are made.

2603 (CONF-9304191–4) **Spin-polaron theory of high-$T_c$superconductivity: 2, electronic structure of the CuO_2 planes.** Wood, R.F. Oak Ridge National Lab., TN (United States). Jun 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on high-T_c superconductivity and its applications; Cairo (Egypt); 4-16 Apr 1993. Order Number DE93019197. Source: OSTI; NTIS; INIS; GPO Dep.

After an introductory discussion of electronic structure calculations for the CuO_2 planes in the copper-oxide based high-$T_c$superconductors, the method suggested by Slater for studying antiferromagnetic (AF) metals is described. In this method, as applied here, the chemical unit cell is doubled to form a magnetic unit cell which contains one Cu ion with predominantly up spin and one with predominantly down spin. Down spins are kept off up-spin sites, and conversely, by the introduction of a Hubbard U term. As a result, the band structure obtained is typical of that for a Mott-Hubbard (M-H) or, more generally, a charge transfer insulator. Conductivity in the a-b plane results when holes are introduced into the M-H valence band. The band structure as a function of the parameters in Koster-Slater type calculations is discussed and the Fermi surface is described. A calculation of the delocalization energy for spin-polaron formation is carried out within the context of the band calculations.

2604 (CONF-930703–34) **Simple estimate of stored energy and conductor insulation voltage-withstand requirements for advanced solenoid magnet designs.** Schwenterly, S.W.; Dresner, L. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International cryogenic engineering conference and international cryogenic materials conference; Albuquerque, NM (United States); 12-16 Jul 1993. Order Number DE93041048. Source: OSTI; NTIS; GPO Dep.

Compact, lightweight, high-current-density superconducting magnets are of interest for many applications. Minimizing the area taken up by conductor stabilizer material and insulation can lead to high dump voltages if the magnet is protected by discharging it through an external resistor. The dump voltages per turn for circular solenoids are estimated for this situation, in terms of the well-known "hotspot integral" $H(\Delta T)$, the maximum on-axis magnetic field B_z, and the stored energy E. The field and stored energy are calculated in terms of the coil geometry parameters α and β. The results depend only on B_z, $H(\Delta T)$, and certain scaling factors, and are independent of the coil size. The relations give simple estimates of the average turn dump voltages for a coil of a given field and geometry which are useful for preliminary scoping studies during conceptual design of the magnet.

2605 (CONF-930703–35) **Stability of an uncooled segment of a high-temperature superconductor.** Dresner, L. Oak Ridge National Lab., TN (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International cryogenic engineering conference and international cryogenic materials conference; Albuquerque, NM (United States); 12-16 Jul 1993. Order Number DE94000476. Source: OSTI; NTIS; GPO Dep.

If the level of a liquid cryogen inadvertently falls below the top of a magnet winding, it may expose a segment of the conductor. Depending on the length of the uncooled segment and on how the matrix resistivity varies with temperature, zero, one, or two steady normal states may be possible. The stability of the various steady states, the conditions under which they appear, their energies of formation, and the voltages they produce are studied in this paper.

2606 (CONF-930703–36) **Test results of two high temperature superconducting sample coils.** Lue, J.W. (Oak Ridge National Lab., TN (United States)); Schwenterly, S.W.; Lubell, M.S.; Luton, J.N.; Joshi, C.H.; Masur, L.J.; Podtburg, E.R. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International cryogenic engineering conference and international cryogenic materials conference; Albuquerque, NM (United States); 12-16 Jul 1993. Order Number DE94000496. Source: OSTI; NTIS; GPO Dep.

Electrical measurements have been performed on two high temperature superconducting coils made by American Superconductor Corporation. One coil measured 24-mm ID, 59-mm OD, 50-mm long, and used 85-m long Y-124 tape conductor. The other coil

measured 29-mm ID, 44-mm OD, 43-mm long, and used 35-m long Bi-2223 tape conductor. V-I curves were measured from room to helium temperature in a variable temperature cryostat cooled by helium gas in external fields up to 5 T. Without external field, the better performing Bi-2223 coil had a critical current, I_c of 14.1 A (2820 A/cm^2 over the conductor) at 4.2 K and 1.8 A (360 A/cm^2) at 77 K. At 5 T, I_c was 4.9 A (980 A/cm^2) at 4.2 K and 2.0 A (400 A/cm^2) at 50 K. Reduced critical current, $I_c(B)/I_c(0)$ vs field plots indicated that a single smooth curve could fit all the data of up to 50 K in temperature. The reduction in critical currents with external fields for the Y-124 coil was more than 80% at 1 T. For the Bi-2223 coil, it was about 38% at 1 T, and about 61% at 5 T.

2607 (DOE/EH–0337T) **Environmental Management Assessment of the Superconducting Super Collider (SSC).** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Audit. Aug 1993. 200p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93041103. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the results of the Environmental Management Assessment performed at the Superconducting Super Collider in Waxahachie, Texas. During this assessment, activities and records were reviewed and interviews were conducted with personnel from the SSC Project Office (SSCPO); the SSC management and operating (M&O) contractor, Universities Research Association, Inc. (URA); and the responsible DOE Headquarters Program Office, the Office of Energy Research (ER). The onsite portion of the assessment was conducted from June 7 through June 21, 1993, by the US Department of Energy's (DOE's) Office of Environmental Audit (EH-24) located within the Office of Environment, Safety and Health (EH).

2608 (LA-UR–93-3241) **Coherence lost? Not-so-fast escapes from the in-phase attractor of a set of globally coupled nonlinear oscillators.** Theiler, J. (Los Alamos National Lab., NM (United States)); Nichols, S. Los Alamos National Lab., NM (United States). 1 Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant N00014-91-J-1257. (CONF-9309185–2: Fluctuations and order: the new synthesis workshop, Los Alamos, NM (United States), 9-12 Sep 1993). Order Number DE94000799. Source: OSTI; NTIS; GPO Dep.

The sensitivity to noise of the coherent (or in-phase) attractor for a set of N globally coupled maps is studied; these discrete-time maps are associated with the continuous-time equations of motion for a series array of Josephson junction oscillators. We investigate both geometrical properties of the basin of attraction in the large N limit, and the implications of this geometry on the average time for the system to "escape" from the coherently oscillating mode. Our main results are that the attractor basin maintains a box-shaped "core" of finite radius even as $N \rightarrow \infty$, and that the in-phase attractor of a large N array is much less vulnerable to noise than are the out-of-phase attractors.

2609 (LA-UR–93-3329) **A valence-fluctuation theory of cuprate superconductivity.** Brandow, B.H. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930865–11: International conference on strongly correlated electron systems, La Jolla, CA (United States), 16-19 Aug 1993). Order Number DE94000887. Source: OSTI; NTIS; GPO Dep.

The concepts and formalism of valence-fluctuation theory are applied to an Anderson lattice model of the CuO_2 plane. Using a self-consistent variational treatment at the (1/N) level, for a finite-U lattice, we find adequate pairing attraction for realistic Hamiltonian parameters. Several unconventional features of the cuprate phenomenology are explained, including the extremely short coherence length, large resistivity, and strong gap anisotropy.

2610 (NUTEK-NYEL–93-2) **Superconducting thin films and microelectronic applications.** Ohlsen, H. (Royal Inst. of Tech., Kista (Sweden). Solid State Electronics Division). Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 1993. 23p. (In Swedish). Project NUTEK-616-068. Order Number DE94709783. Source: OSTI; NTIS.

The main activity at IM/FTE during the project period 1990-1992, has been directed towards in-situ fabrication of thin films of $YBa_2Cu_3O_7$ (YBCO). The process is based on mass-spectrometer controlled coevaporation with an atomic oxygen flow directed towards the substrate. The oxygen rf-plasma discharge chamber is located close to the substrate. The in-situ fabrication has been concentrated on films with thicknesses of 100 to 3000 Aa on $LaAlO_3$ substrates. YBCO films deposited at a temperature of 725 deg C has shown T_c values of 88 K. The resistivity in the normal conducting state is relatively low with a value of 55 $\mu\Omega$cm at 100 K. Magnetic measurements has shown a homogeneous superconducting phase. Transport measurements of the critical current density as a function of temperature has been performed on patterned YBCO using argon ion milling. Two-layer structures consisting of YBCO and an insulator, Y_2O_3 (yttria), has been fabricated in-situ. Magnetic measurements of the YBCO layers in these structures showed a T_c of 88 K and a critical current density of 2x10^6 A/cm^2. By shielding the Ba and Cu source with a shutter a three-layer structure was fabricated in-situ. The sequence was YBCO-Y_2O_3-YBCO and the thicknesses 1400/1000/1400 Aa, respectively. These YBCO layers showed a T_c of 85 K and a J_c of 1.2x10^6 A/cm^2 at 77 K and 1.7x10^7 A/cm^2 at 20 K. Different resonator structures of in-situ as well as ex-situ films has been fabricated. Q-values up to 1700 at 6 GHz and 77 K has been obtained. Measurements of spontaneous fluctuations in the conductivity has been performed on in-situ and ex-situ films deposited on different substrates. The YBCO films fabricated in-situ within the project today, has properties which definitely are internationally competitive.

2611 (SAND–93-1060C) **High temperature superconducting digital circuits and subsystems.** Martens, J.S. (Conductus, Sunnyvale, CA (United States)); Pance, A.; Whiteley, S.R.; Char, K.; Johansson, M.F.; Lee, L.; Hietala, V.M.; Wendt, J.R.; Hou, S.Y.; Phillips, J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC04-76DP00789. Contract F19628-90-C-0149;N00014/92/C-2017. (CONF-9311101–3: GOMAC 93: government microcircuit application conference, New Orleans, LA (United States), 1-4 Nov 1993). Order Number DE94001207. Source: OSTI; NTIS; GPO Dep.

The advances in the fabrication of high temperature superconducting devices have enabled the demonstration of high performance and useful digital circuits and subsystems. The yield and uniformity of the devices is sufficient for circuit fabrication at the medium scale integration (MSI) level with performance not seen before at 77 K. The circuits demonstrated to date include simple gates, counters, analog to digital converters, and shift registers. All of these are mid-sized building blocks for potential applications in commercial and military systems. The processes used for these circuits and blocks will be discussed along with observed performance data.

2612 (SAND–93-1588) **Flow and heat transfer model for a rotating cryogenic motor.** Dykhuizen, R.C.; Baca, R.G.; Bickel, T.C. Sandia National Labs., Albuquerque, NM (United States). Aug 1993. 31p. Sponsored by USDOE, Washington, DC (United States); Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC04-76DP00789. Order Number DE94001151. Source: OSTI; NTIS; GPO Dep.

Development of a high-temperature, superconducting, synchronous motor for large applications (>1000 HP) could offer significant electrical power savings for industrial users. Presently 60% of all electric power generated in the United States is converted by electric motors. A large part of two power is utilized by motors 1000 HP or larger. The use of high-temperature superconducting materials with critical temperatures above that of liquid nitrogen (77 K) in the field winding would reduce the losses in these motors significantly, and therefore, would have a definite impact on the electrical power usage in the US. These motors will be 1/3 to 1/2 the size of conventional motors of similar power and, thus, offer potential savings in materials and floor space. The cooling of the superconducting materials in the field windings of the rotor presents a unique application of cryogenic engineering. The rotational velocity results in significant radial pressure gradients

that affect the flow distribution of the cryogen. The internal pressure fields can result in significant nonuniformities in the two-phase flow of the coolant. Due to the variable speed design, the flow distribution has the potential to change during operation. A multiphase-flow computer model of the cryogenic cooling is developed to calculate the boiling heat transfer and phase distribution of the nitrogen coolant in the motor. The model accounts for unequal phase velocities and nonuniform cooling requirements of the rotor. The unequal radial pressure gradients in the inlet and outlet headers result in a larger driving force for flow in the outer cooling channels. The effect of this must be accounted for in the design of the motor. Continuing improvements of the model will allow the investigation of the transient thermal issues associated with localized quenching of the superconducting components of the motor.

665420 Superfluidity

2613 (JINR-E-17-92-348) **Fluctuations of Bose-condensate in the Bogolubov model.** Yarunin, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 8p. Order Number DE94606935. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Teor. Mat. Fiz.

The stationary phase method in the canonical ensemble with constraints is used to calculate the statistical sum of Bogolubov model with respect to over-condensate (quantum) and condensate (classical) variables. Formulae are derived for expectation values and variances of the particle number of both components. Numerical estimations show that the level of thermal fluctuations exceeds its occupation number at temperatures 1 K<T<T_0 and that the opposite situation is at 0<T<1 K, where T_0 is the phase transition temperature. The importance of the observed fact for interpretation of experiments in seaching for the density of a superfluid component in liquid ^{4}He is discussed. 11 refs.

6655 Direct Energy Conversion

Refer also to citation(s) 1384

2614 (INIS-mf-13710, pp. 47) **The application of MHD technology to technological processes.** Gelfgat, Y.M. (AN Latvijskoj SSR, Riga (Latvia)). Mar 1990. 168p. (CONF-9002222–: 6. international Beer Sheva seminar on MHD flows and turbulence, Jerusalem (Israel), 25 Feb - 2 mar 1990). In *The sixth international Beer Sheva seminar on MHD flows and turbulence: Abstracts.* Order Number DE94602952. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CRYSTAL GROWTH METHODS/magnetohydrodynamics; MAGNETOHYDRODYNAMICS; MONOCRYSTALS; SILICON

70 PLASMA PHYSICS AND FUSION

Refer also to citation(s) 450, 1370

2615 (DOE/ET/51013–302) **Massachusetts Institute of Technology Plasma Fusion Center 1992–1993 report to the President.** Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. Jul 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-78ET51013. (PFC/IR–93-1). Order Number DE94001725. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses research being conducted at MIT's plasma fusion center. Some of the areas covered are: plasma diagnostics; rf plasma heating; gyrotron research; treatment of solid waste by arc plasma; divertor experiments; tokamak studies; and plasma and fusion theory.

7003 Plasma Physics and Fusion Research

Refer also to citation(s) 2300, 2315, 2539, 2552, 2729, 2739, 2740

2616 (CEA-CONF–11380) **Electron capture from Li by B^{5+}, N^{5+}, Be^{4+} and C^{4+} Ions.** Pascale, J. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules); Hoekstra, R.; Folkerts, H.O.; Morgenstern, R.; Olson, R.E.; Wolfrum, E.; Heer, F.J. de. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules. 1993. 2p. (CONF-930711–: 18. international conference on the physics of electronic and atomic collisions, Aarhus (Denmark), 21-27 Jul 1993). Order Number DE94606812. Source: OSTI; NTIS (US Sales Only); INIS.

Electron capture processes are studied by means of photon emission spectroscopy experiments and classical trajectory Monte Carlo calculation. The projectile- core electrons do not significantly influence the electron capture processes. This result is important because it allows to simulate electron capture from the collision between Be^{4+} and Li(2s) by the collision C^{4+}+Li(2s). The knowledge of electron capture cross sections in the nl levels are of great interest for the study of plasma impurities: B^{5+}, N^{5+} and Be^{4+} in Tokamak devices with Li(2s) for probing the edge region of the controlled thermonuclear plasmas.

2617 (CNIC–00637) **The impurity transport in HT-6B tokamak.** Huang Rong (Academia Sinica, Hefei, AH (China). Inst. of Plasma Physics); Xie Jikang; Li Linzhong; He Yexi; Wang Shuya; Deng Chuanbao; Li Guoxiang; Qiu Lijian. China Nuclear Information Centre, Beijing, BJ (China). Jun 1992. 15p. (ASIPP–0033.). Order Number DE94604989. Source: OSTI; NTIS (US Sales Only); INIS.

The quasi-stationary profiles of the impurity ionization stages in HT-6B tokamak were determined by monitoring the VUV (vacuum ultraviolet) and visible line emissions from impurities. An impurity transport code was set up. The impurity transport coefficients and other parameters of impurities in that device were simulated and determined. From the measurement of impurity emission profiles and simulation analysis, it is concluded that the impurity confinement is improved and the impurity recycling is reduced by the slow magnetic compression. Some characteristics of impurity transport in that device are also discussed.

2618 (CNIC–00658) **The calculation for energy balance of heating plasmas by Alfven waves.** Long Yongxing (Southwest Inst. of Physics, Leshan, SC (China)); Ding Ning; He Qibing; Qu Wenxiao; Huang Lin; Qiu Xiaoming. China Nuclear Information Centre, Beijing, BJ (China). Oct 1992. 8p. (In Chinese). (SIP–0050.). Order Number DE94604994. Source: OSTI; NTIS (US Sales Only); INIS.

A numerical method for computing the energy balance of heating tokamak plasmas by Alfven waves is introduced. The results are in agreement with experiments. This method is not only simpler and more distinct but also considerably saving time in computation. It also can be used in kinetic problems with other types of radio frequency (RF) heating.

2619 (CNIC–00665) **Analysis of density limit and efficiency in lower hybrid current drive.** Yin Yongxiang (Southwest Inst. of Physics, Leshan, SC (China)); Li Xiaodong. China Nuclear Information Centre, Beijing, BJ (China). Jul 1992. 8p. (SIP–0053.). Order Number DE94604995. Source: OSTI; NTIS (US Sales Only); INIS.

The conditions of accessibility and parameter decay instability as well as the power spectrum are used to analyse the density limit and efficiency of lower hybrid current drive (LHCD). For convenience of the analysis, an equal-$N_{//}$ curve and an operation curve are defined, where $N_{//}$ is the refractive index of lower hybrid wave paralleled to toroidal magnetic field. By means of the two kind curves, the dependences of density limit and efficiency of LHCD on toroidal magnetic field B_0 pump frequency f_0, electron density n_e and electron temperature T_e are obtained, which are good in agreement with LHCD experiments on most tokamaks.

2620 (CONF-9305210–4) **Overview of the ATF stellarator program.** Lyon, J.F. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. International Atomic Energy Agency (IAEA) workshop on stellarators; Garching (Germany); 10-14 May 1993. Order Number DE94000371. Source: OSTI; NTIS; INIS; GPO Dep.

ATF, the world's largest stellarator, has major radius R_0 = 2.1 m, average plasma radius α_p = 0.27 m, and on-axis field B_0 = 2 T. In

May 1991, an electrical arc occurred in one of the joints in a helical field (HF) winding, causing severe damage to two of the HF winding segments. A temporary repair was made and ATF resumed operation in September 1991, but operation was limited to B_0 = 1 T. A set of experiments on microwave scattering, confinement scaling, and ion cyclotron heating was completed before ATF was shut down for a permanent repair in November 1991. The microwave scattering measurements of electron density fluctuations in the core of low-collisionality electron cyclotron heated (ECH) plasmas showed features that might be evidence of trapped electron instabilities.

2621 (CONF-9305210–5) **Fluctuations and confinement in ATF.** Isler, R.C.; Harris, J.H.; Murakami, M. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. International Atomic Energy Agency (IAEA) workshop on stellarators; Garching (Germany); 10-14 May 1993. Order Number DE94000485. Source: OSTI; NTIS; INIS; GPO Dep.

In the period immediately prior to the suspension of ATF operation in November, 1991, a great deal of emphasis was palced on investigations of the fundamental mechanisms controlling confinement in this device. At that time, measurements of the density fluctuations throughout the plasma volume indicated the existence of theoretically predicted dissipative trapped electron and resistive interchange instabilities. These identifications were supported by results of dynamic configuration scans of the magnetic fields during which the extent of the magnetic well, shear, and fraction of confined trapped particles were changed continuously. Interpretation of the data from these experiments has been an ongoing exercise. Most recently, analysis of discharges employing strong gas puffing to change density gradients and fluctuation levels have strengthened the view that dissipative trapped electron modes may be present but do not play a significant direct role in energy transport. The present paper summarizes the current understanding concerning the identification of instabilities and their relationship to confinement in ATF.

2622 (CONF-9305210–6) **Effects of magnetic field perturbations in the ATF torsatron.** Colchin, R.J. (Oak Ridge National Lab., TN (United States)); England, A.C.; Isler, R.C.; Murakami, M.; Rasmussen, D.A.; Uckan, T.; Wilgen, J.B.; Aceto, S.C.; Zielinski, J.J. Oak Ridge National Lab., TN (United States). [1993]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. International Atomic Energy Agency (IAEA) workshop on stellarators; Garching (Germany); 10-14 May 1993. Order Number DE94000474. Source: OSTI; NTIS; INIS; GPO Dep.

The effects of errors in the magnetic fields of tokamaks on the plasma are quite different from those in stellarators. In tokamaks, field errors can cause disruptive locked modes through the non-linear evolution of tearing modes acting on initially small error-induced islands. Scaling predictions for these effects indicate that the critical relative field error which can be tolerated becomes smaller as the tokamak size becomes larger. In stellarators, the effect is more benign, as field errors appear only to cause increased plasma transport in the vicinity of islands. Great care has been taken to minimize magnetic field errors in the most recent generation of stellarator-type magnetic plasma traps. In the past six years, several new and sensitive techniques have been developed to detect and map field errors. These methods all rely on the detection of electrons injected along magnetic field lines. During the commissioning of ATF, flux surfaces were mapped using the fluorescent screen technique. Field errors were discovered and traced to uncompensated dipoles in the helical current feeds. Prior to elimination of these errors, plasma discharges indicated centrally peaked plasma profiles. After correction of the uncompensated dipoles, flux surfaces were mapped a second time, and the island widths were found to be greatly reduced. Field errors were then deliberately introduced using a set of perturbation coils that had been added to ATF, and electron-beam mapping of the flux surfaces showed that islands several centimeters in width could easily be created by these coils. After elimination of the error fields, the measured plasma temperature and density profiles were much broader. The field-perturbation coils were then used to produce magnetic field asymmetries, and the measured plasma profiles were again shown to narrow as a result of islands.

2623 (CONF-930720–20) **Fast wave at 433 MHz on FTU by a folded waveguide launcher.** Barbato, E. (ENEA, Frascati (Italy). Centro Ricerche Energia); De Marco, F.; Jaeger, E.F.; Carter, M.D.; Hoffman, D.J.; Baity, F.W.; Goldfinger, R.; Batchelor, D.B. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 20. European conference on controlled fusion and plasma physics; Lisbon (Portugal); 26-30 Jul 1993. Order Number DE94000375. Source: OSTI; NTIS; INIS; GPO Dep.

The use of fast wave (FW) power to interact directly with electrons is a useful tool for central heating of high density, high temperature plasmas and for electron current drive (CD). Direct electron heating by FW has been observed on JET and TFTR and, although FW absorption is weak at low β, successful electron heating and CD have been achieved on DIII-D at Te=2–3keV. The folded waveguide (FWG) is a promising new concept for ICRF launchers having the advantage of compact, rigid structure and very low impedence (E_y/H_z) at the plasma edge. The FWG is particularly attractive for FTU since loop antennas suffer efficiency degradation at high frequency due to poloidal current decrease, whereas the RF flux coupled by a FWG is more poloidally uniform. Here we consider the possibility of injecting $\sim$ 1 MW of FW at 433 MHz into the FTU-Tokamak using the FWG as a launcher. Besides testing the FWG, and studying the FW electron heating regime, an other interesting issue of this experiment would be the study of possible sinergy between FW and the lower hybrid wave (LHW) at 8 GHz which is also available on FTU. The main parameters of FTU are a=30 cm, R_0=90 cm, B_T=4–8 T, I_p<1.5MA, n_e=0.4–2.0 $10^{14}cm^{-3}$.

2624 (CTH-IEFT-PP–1992-30) **Impurity effects on ITG and DTE drift modes and stability properties.** Jarmen, A.; Froejdh, M. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1992]. 27p. Order Number DE94606759. Source: OSTI; NTIS; INIS.

Toroidal drift mode features and stability are studied for a plasma with two ion species: impurity and main ions. Impurity and main ion temperature gradient (ITG) modes dominate for larger temperature gradients, η_i>1, while dissipative trapped electron (DTE) and impurity induced modes are present also for η_i<1. Simple analytical expressions for the stability thresholds are derived from conditions given by the impurity and main ion fluids. (24 refs.).

2625 (CTH-IEFT-PP–1993-07) **Memory effects in turbulent diffusion.** Zagorodny, A.G.; Weiland, J.; Wilhelmsson, H. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1993]. 9p. Order Number DE94606760. Source: OSTI; NTIS; INIS.

A non-Markovian approach is proposed for the derivation of the diffusion coefficient of saturated turbulence. A memory term accounting for nonlocal coherence effects is introduced in a new attempt to describe the transition between weak and strong turbulence. The result compares favourably with recent experiments as well as mode coupling simulations of fusion plasmas. (14 refs.).

2626 (CTH-IEFT-PP–1993-08) **Profile effects on ignition conditions in fusion plasmas.** Wising, F.; Anderson, D.; Lisak, M.; Benda, M. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1993]. 23p. Order Number DE94606796. Source: OSTI; NTIS; INIS.

The present investigation presents an explicit condition for determining whether a given temperature profile in a fusion plasma, established by means of auxiliary heating, will evolve towards ignition or quench under the competing influence of alpha particle heating and thermal conduction. The predictions are found to compare well with numerical simulations. The result is also used to demonstrate that peaked temperature profiles are advantageous from the point of view that the total plasma energy to be established by auxiliary heating in order to reach ignition is minimized. (7 refs., 4 figs.).

2627 (CTH-IEFT-PP–1993-10) **Self-consistent treatment of transport in tokamak plasmas.** Wilhelmsson, H. (Laboratoire de

Physique des Milieux Ionises, Ecole Polytechnique, Palaiseau (France)); Le Roux, M.N. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1993]. 78p. Order Number DE94606761. Source: OSTI; NTIS; INIS.

A theory is developed for the dynamics of tokamak plasmas considering the influence of combinations of simultaneous heating processes (alpha particle, auxiliary and ohmic), thermal conduction and particle diffusion, thermal and particle pinches, thermalization of alpha particles as well as the effects of boundary conditions. The analysis is based on a generalization of the central expansion technique which transforms the partial differential equations to a set of nonlinear coupled equations in time for the dynamic variables. Oscillatory solutions are found, but only in the presence of alpha particle heating. Examples of extensive computer simulations are included which support and complete the analytic results. (26 refs.).

2628 (CTH-IEFT-PP–1993-12) **Parametric excitation of drift wave in a sheared slab geometry.** Davydova, T.A. (Inst. for Nuclear Research, Ukrainan Academy of Sciences, Kiev (Ukraine)); Jovanovic, D.; Vranjes, J.; Weiland, J. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1993]. 14p. Order Number DE94606777. Source: OSTI; NTIS; INIS.

The threshold for parametric excitation of drift waves in a sheared slab geometry is calculated for a drift-wave pump which has a standing wave structure along the magnetic field, and the coupling is achieved by the Hasegawa-Mima vector product-type nonlinearity. The usual shear damping is counteracted by the parametric interaction and the eigenvalue problem is solved analytically using Taylor's strong coupling approximation. (11 refs.).

2629 (CTH-IEFT-PP–1993-14) **Quasi-linear theory for a tokamak plasma in the presence of cyclotron resonance.** Belikov, V.S.; Kolesnichenko, Ya.I. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. [1993]. 27p. Order Number DE94606770. Source: OSTI; NTIS; INIS.

Quasi-linear diffusion equations for the distribution function of trapped and circulating particles interacting with waves in a tokamak by means of cyclotron resonance are derived. The resulting equations reveal new features of quasi-linear diffusion and are of two kinds, one which involves bounce resonances overlapping in velocity space and one with well separated bounce resonances. These two cases correspond to situations where the phase of the wave-particle interaction between successive resonances can be considered as random or deterministic, respectively. An analysis of the conditions of applicability of the new equations is carried out and previous well-known forms of the quasi-linear diffusion equations are shown to be recovered in the proper limits. (10 refs., 3 figs.).

2630 (DOE/ER/53198–223) **Chaos in plasma simulation and experiment.** Watts, C. (Texas Univ., Austin, TX (United States). Fusion Research Center); Newman, D.E.; Sprott, J.C. Wisconsin Univ., Madison, WI (United States). Plasma Physics Research. Sep 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER53198. Order Number DE94001574. Source: OSTI; NTIS; INIS; GPO Dep.

We investigate the possibility that chaos and simple determinism are governing the dynamics of reversed field pinch (RFP) plasmas using data from both numerical simulations and experiment. A large repertoire of nonlinear analysis techniques is used to identify low dimensional chaos. These tools include phase portraits and Poincard sections, correlation dimension, the spectrum of Lyapunov exponents and short term predictability. In addition, nonlinear noise reduction techniques are applied to the experimental data in an attempt to extract any underlying deterministic dynamics. Two model systems are used to simulate the plasma dynamics. These are -the DEBS code, which models global RFP dynamics, and the dissipative trapped electron mode (DTEM) model, which models drift wave turbulence. Data from both simulations show strong indications of low,dimensional chaos and simple determinism. Experimental data were obtained from the Madison Symmetric Torus RFP and consist of a wide array of both global and local diagnostic signals. None of the signals shows any indication of low dimensional chaos or other simple determinism. Moreover, most of the analysis tools indicate the experimental system is very high dimensional with properties similar to noise. Nonlinear noise reduction is unsuccessful at extracting an underlying deterministic system.

2631 (DOE/ER/53198–224) **Chaos and simple determinism in reversed field pinch plasmas: Nonlinear analysis of numerical simulation and experimental data.** Watts, C.A. Wisconsin Univ., Madison, WI (United States). Plasma Physics Research. Sep 1993. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER53198. Order Number DE94001575. Source: OSTI; NTIS; INIS; GPO Dep.

In this dissertation the possibility that chaos and simple determinism are governing the dynamics of reversed field pinch (RFP) plasmas is investigated. To properly assess this possibility, data from both numerical simulations and experiment are analyzed. A large repertoire of nonlinear analysis techniques is used to identify low dimensional chaos in the data. These tools include phase portraits and Poincare sections, correlation dimension, the spectrum of Lyapunov exponents and short term predictability. In addition, nonlinear noise reduction techniques are applied to the experimental data in an attempt to extract any underlying deterministic dynamics. Two model systems are used to simulate the plasma dynamics. These are the DEBS code, which models global RFP dynamics, and the dissipative trapped electron mode (DTEM) model, which models drift wave turbulence. Data from both simulations show strong indications of low dimensional chaos and simple determinism. Experimental date were obtained from the Madison Symmetric Torus RFP and consist of a wide array of both global and local diagnostic signals. None of the signals shows any indication of low dimensional chaos or low simple determinism. Moreover, most of the analysis tools indicate the experimental system is very high dimensional with properties similar to noise. Nonlinear noise reduction is unsuccessful at extracting an underlying deterministic system.

2632 (DOE/ER/53198–226) **Plasma research in the Madison Symmetric Torus (MST): Annual technical progress report, November 1, 1990–October 31, 1993.** Prager, S.C. Wisconsin Univ., Madison, WI (United States). Dept. of Physics. [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER53198. Order Number DE94002318. Source: OSTI; NTIS; INIS; GPO Dep.

We present physics results divided into the four categories (confinement optimization, transport measurements, fluctuations and fluctuation-induced transport, and fluctuation suppression). For simplicity, we highlight a subset of original MST results which are presented as 13 specific conclusions (not listed in order of importance), each followed by a brief elaboration. Within each of the four categories we also present other progress.

2633 (DOE/ER/53218–22) **Fusion Plasma Theory: Task 1, Magnetic confinement Fusion Plasma Theory: Annual progress report, November 16, 1992–November 15, 1993.** Callen, J.D. Wisconsin Univ., Madison, WI (United States). Dept. of Nuclear Engineering and Engineering Physics. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER53218. Order Number DE94000778. Source: OSTI; NTIS; INIS; GPO Dep.

The research performed under this grant during the current year has concentrated on few tokamak plasma confinement issues: applications of our new Chapman-Enskog-like approach for developing hybrid fluid/kinetic descriptions of tokamak plasmas; multi-faceted studies as part of our development of a new interacting island paradigm for the tokamak equilibrium" and transport; investigations of the resolution power of BES and ECE diagnostics for measuring core plasma fluctuations; and studies of net transport in the presence of fluctuating surfaces. Recent progress and publications in these areas, and in the management of the NERSC node and the fusion theory workstations are summarized briefly in this report.

2634 (DOE/ET/53088–602) **A unified Monte Carlo interpretation of particle simulations and applications to nonneutral plasmas.** Aydemir, A.Y. Texas Univ., Austin, TX (United States).

Inst. for Fusion Studies. Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–602). Order Number DE94001231. Source: OSTI; NTIS; INIS; GPO Dep.

Using a "Monte Carlo interpretation" a particle simulations, a general description of low-noise techniques is developed in terms well-known Monte Carlo variance reduction methods. Some of these techniques then are applied to linear and nonlinear studies of pure electron plasmas in cylindrical geometry, with emphasis on the generation and nonlinear evolution of electron vortices. Long-lived l = 1 and l and l = 2 vortices, and others produced by unstable diocotron modes in hollow profiles, are studies. It is shown that low-noise techniques make it possible to follow the linear evolution and saturation of even the very weakly unstable resonant diocotron modes.

2635 (DOE/ET/53088–614) **An explanation for experimental observations of harmonic cyclotron emission induced by fast ions.** Chen, K.R.; Horton, W.; Van Dam, J.W. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–614). Order Number DE94001232. Source: OSTI; NTIS; INIS; GPO Dep.

An explanation, supported by numerical simulations and analytical theory, is given for the harmonic cyclotron emission induced by fast ions in tokamak plasmas - particular, for the emission observed at low harmonics in deuterium-deuterium md deuterium-tritium experiments in the Joint European Tokamak. We show that the first proton harmonic is one of the highest spectral peaks whereas the first alpha is weak. We also compare the relative spectral amplitudes of different harmonics. Our results axe consistent with the experimental observations. The simulations verify that the instabilities are caused by a weak relativistic mass effect. Simulation that a nonuniform magnetic field leads to no appreciable change in the growth and saturation amplitude of the waves.

2636 (DOE/ET/53088–621) **Continuum damping of ideal toroidal Alfven eigenmodes.** Zhang, X.D.; Zhang, Y.Z.; Mahajan, S.M. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Aug 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–621). Order Number DE94001233. Source: OSTI; NTIS; INIS; GPO Dep.

A perturbation theory based on the two dimensional (2D) ballooning transform is systematically developed for ideal toroidal Alfven eigenmodes (TAEs). A formula, similar to the Fermi golden rule for decaying systems in quantum mechanics, is derived for the continuum damping rate of the TAE; the decay (damping) rate is expressed explicitly in terms of the coupling of the TAE to the continuum spectrum. Numerical results are compared with previous calculations. It is found that in some narrow intervals of the parameter mε the damping rate varies very rapidly. These regions correspond precisely to the root missing intervals of the numerical solution by Rosenbluth et al.

2637 (DOE/ET/53088–623) **Kinetic resonance damping rate of the toroidal ion temperature gradient mode.** Kim, J.Y.; Kishimoto, Y.; Horton, W.; Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Sep 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–623). Order Number DE94001234. Source: OSTI; NTIS; INIS; GPO Dep.

The linear damping rates of the toroidal ion temperature gradient (η_i) mode due to the toroidal resonance are calculated in the local kinetic limit. The well-known Landau contour method is generalized to treat the analytic continuation problem of the guiding center dispersion function in the toroidal resonance system where the resonance occurs from both the magnetic ΔB-curvature drift and the parallel ion transit drift. A detailed numerical analysis is presented for the dependence of the damping rate of the toroidal η_i mode on various parameters such as ε_n, κ_y, and the trapped electron fraction. In addition, a consideration is presented on the decay problem of the ballistic response by the phase mixing in the toroidal system, which is directly related to the present damping problem of the wave normal modes by the toroidal resonance.

2638 (DOE/OR/00033–T545) **Electron cyclotron resonance hydrogen/helium plasma characterization and simulation of pumping in tokamaks.** Outten, C.A. (Michigan Univ., Ann Arbor, MI (United States)). Oak Ridge Inst. for Science and Education, TN (United States); Michigan Univ., Ann Arbor, MI (United States). 1992. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000839. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to University of Michigan, Ann Arbor, MI.

Electron Cyclotron Resonance (ECR) plasmas have been employed to simulate the plasma conditions at the edge of a tokamak in order to investigate hydrogen/helium uptake in thin metal films. The process of microwave power absorption, important to characterizing the ECR plasma source, was investigated by measuring the electron density and temperature with a Langmuir probe and optical spectroscopy as a function of the magnetic field gradient and incident microwave power. A novel diagnostic, carbon resistance probe, provided a direct measure of the ion energy and fluence while measurements from a Langmuir probe were used for comparison. The Langmuir probe gave a plasma potential minus floating potential of 30 $\pm$ 5 eV, in good agreement with the carbon resistance probe result of ion energy $\leq$ 40 eV. The measured ion energy was consistent with the ion energy predicted from a model based upon divergent magnetic field extraction. Also, based upon physical sputtering of the carbon, the hydrogen fluence rate was determined to be 1 $\times$ 10^{16}/cm^2-sec for 50 Watts of incident microwave power. ECR hydrogen/helium plasmas were used to study preferential pumping of helium in candidate materials for tokamak pump-limiters: nickel, vanadium, aluminum, and nickel/aluminum multi-layers. Nickel and vanadium exhibited similar pumping capacities whereas aluminum showed a reduced capacity due to increased sputtering. A helium retention model based upon ion implantation ranges and sputtering rates agreed with the experimental data. A new multilayer/bilayer pumping concept showed improved pumping above that for single element films.

2639 (ENEA-RT-NUCL–92-27) **Analysis of neutral beam current drive for ITER.** Zhang, C. (Academia Sinica, Hefei (China). Institute of Plasma Physics); Romanelli, F. Dec 1992. 40p. (RT/NUCL–92-27). Order Number DE94716590. Source: OSTI; NTIS (US Sales Only).

An analysis of the neutral beam current drive for ITER has been performed. The neutral beam deposition profile for a model elliptic equilibrium is evaluated for arbitrary density profiles. Multistep ionization is accounted for. The neutral beam current density is calculated by using an approximate solution of the Fokker-Planck equation. A parameter scan has been performed by changing electron density, plasma temperature, the plasma effective ionic charge Z_{eff} beam energy E_b, beam mass number, beam section and tangency radius of the beam centre. The largest values of the current drive figures-of-merit $Y_{nb}=I_{nb}nR/P$ are obtained for the largest beam energy. The obtained value of Y_{nb} for the ITER reference scenario is Y_{nb}=0. 6. for E_b=1. 3 MeV, Z_{eff}=2.

2640 (ENEA-RT-NUCL–92-28) **Neutral beam current drive on dioscur.** Zhang, C. (Academia Sinica, Hefei (China). Institute of Plasma Physics); Romanelli, F. Dec 1992. 22p. (RT/NUCL–92-28). Order Number DE94716602. Source: OSTI; NTIS (US Sales Only).

A preliminary analysis of the neutral beam current drive (NBCD) on DIOSCUR has ben performed by using a numerical simulation model. The dependence of the current drive figure-of-merit $Y_{nb}=I_nb$ nR/P_b and driven current profile on both beam and plasma parameters has been studied. For H-mode discharge with Z_{eff}=2 and a D^0 beam injection, beam power P_b=50 MW, beam particle energy E_b=l MeV, the driven current is 4.9 MA, corresponding to a figure of merit Y_{nb}=0. 37.

2641 (ETDE-IT–93-220) **Four-channel polarizing interferometer for ECE measurements on FTU tokamak.** Buratti, P. (ENEA, Frascati (Italy)); Zerbini, M. 1993. 2p. (CONF-9309266–2: 18. international conference on infrared and millimeter waves, Essex (United Kingdom), 6-10 Sep 1993). Order Number DE94716512. Source: OSTI; NTIS (US Sales Only).

Fourier Transform Spectrometers (FTS) are very useful for ECE measurements since they can be absolutely calibrated by standard

blackbody sources, so that independent electron temperature measurements can be obtained. The simultaneous use of several spectrometers is often required, either to analyse two dimensional configurations or to study the spatial distribution of suprathermal electrons. The path difference in conventional FTS is scanned by translating a plane mirror; an alternative scheme is based on the rotation of a screw shaped reflector; this makes possible the development of multichannel instruments with a single, very fast scanning device.

2642 (EUR-CEA-FC–1474) **Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.** Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. 86p. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). Source: OSTI; NTIS (US Sales Only); INIS.

Separate abstracts were prepared for 7 papers in this report.

2643 (EUR-CEA-FC–1474, pp. 1-12) **Diagnosing fast electron diffusion by EC radiation.** Giruzzi, G. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of the radial diffusion of fast electrons in tokamak plasmas and its impact on EC diagnostics is investigated. A 3-dimensional Fokker-Planck code has been developed describing the evolution of the electron distribution function under the action of Coulomb collisions, dc electric fields, RF heating and radial diffusion induced by turbulent magnetic fields. The numerically computed distribution function can be used to evaluate electron cyclotron emission or transmission spectra for any harmonic or propagation angle by means of a radiation code including 3-dimensional ray-tracing for a multiple-ray system modelling the finite width of the radiated beams. This numerical tool is applied to investigate fast electron diffusion both in Ohmic and in LHCD plasmas. In Ohmic plasmas, non-Maxwellian distributions are generated by the radial diffusion process in the pressure gradient region; it is shown that ECE in the equatorial plane is not suitable for detecting such non-Maxwellian features, whereas vertical emission of transmission measurements on non-central chords yields, in principle, detailed information on the structure of the superthermal electron distribution. This indirect effect can be used to investigate the radial structure and properties of the turbulent fields. In LHCD plasmas, the possibility of diagnosing fast electron diffusion by ECE in the equatorial plane at large toroidal angles and frequencies between the first and second harmonic is analyzed and discussed.

2644 (EUR-CEA-FC–1474, pp. 13-26) **Overview of recent results from the Tore Supra ECE diagnostics.** Talvard, M. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Liu, W.D.; Giruzzi, G. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

The Tore Supra ECE diagnostic system consists of a set of 3 Michelson and 12 Fabry-Perot interferometers, which is now fully operational. We present results obtained with the 3 Michelson during LHCD experiments first. It is shown how the sensitivity of the diagnostic to rather high v (perpendicular) prevents detection of v (parallel) anisotropies. On the other hand, measurements during the Ohmic phase reveal some unexpected anisotropy which can be attributed to superthermal electrons related to the bootstrap current. The 12 Fabry-Perot have been operated using high acquisition sampling rates during pellet injection experiments. A shudder preceding the pellet itself is clearly evidenced just before an internal disruption occurs. During sawtooth activity, such measurements are also used to study the dynamics of the m=1, n=1 instability on the q=1 surface itself.

2645 (EUR-CEA-FC–1474, pp. 27-40) **Electron cyclotron absorption measurements in Tore-Supra during lower hybrid current drive.** Segui, J.L. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Giruzzi, G.; Vezard, D.; Liu, W.D.; Caron, X.; Meyer, R.L. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

A transmission diagnostic system working in the frequency range 77-109 GHz has been implemented in the Tore Supra tokamak. It makes use of an ordinary mode launched along a vertical diameter, i.e, propagating along a nearly constant magnetic field. A modulation of the incident power allows to increase the signal to noise ratio. The purpose of the diagnostic is to measure electron cyclotron absorption (ECA) below the electron cyclotron frequency f_c in the presence of the fast electron tails created during lower-hybrid current drive. As is known, for a parallel electron tail, the absorption coefficient at $f<f_c$ is proportional to the parallel distribution function and a frequency scan yields, in principle the shape of the parallel distribution as a function of the parallel momentum. The main advantages of ECA with respect to, e.g., electron cyclotron emission (ECE), are that the measurement is not affected by wall reflections and that the absorption coefficient is nearly independent of the perpendicular energy of the fast electrons. On the other hand, the measurement is affected by refraction effects, which can be calculated by means of a ray-tracing code and/or measured during similar ohmic plasmas in both cases, measurements at a frequency where there is no absorption ($f_{max}>f_c$), are used as a reference. Parallel tail distributions measured by this method are presented and their relaxation properties are discussed.

2646 (EUR-CEA-FC–1474, pp. 41-51) **Elliptical polarization for oblique EC-wave launch.** Smits, F.M.A. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

Oblique launch of EC-waves in a magnetized plasma requires an elliptical polarization of the wave. An overview of the requirements on the ellipticity is presented for all relevant cases, based on the coupling of the wave at the plasma edge using the cold plasma approximation.

2647 (EUR-CEA-FC–1474, pp. 52-63) **A new method used to calibrate Fabry-Perot interferometers on tokamaks.** Talvard, M. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Javon, C.; Garcin, M.; Thouvenin, D. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission*

and electron cyclotron resonance heating. 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

Fabry-Perot interferometers are routinely used on the Tore Supra tokamak in order to measure the electron cyclotron emission spectrum especially in the optically thick region (150-300 GHz) for which the intensity is proportional to the electron temperature. In order to give the electron temperature in keV, it is necessary to calibrate the spectral measurements. In practice, one has to determine the calibration curve. The power levels involved in calibration of Fabry-Perot interferometers used on large tokamaks are generally not compatible with classical data processing techniques such as coherent addition or synchronous detection. A new method is presented in this paper able to detect DC signals as low as 0.1 nV. It is based on a proper reduction of the detection frequency bandwidth. The principle of this method is the following: The source signal is chopped and coherently added over N turns of the chopper. The resulting signal is then Fourier analyzed. One finally takes the amplitude at the chopper frequency which allows a much better filtering of the noise. Incident powers less than 1 pW have thus been measured. Till now and probably due to the difficulties detailed above, absolute calibration of Fabry-Perot interferometers has not yet been achieved for applications to plasmas diagnostics in large fusion devices. The method presented here has been first used to achieve this goal. The experimental set up is briefly described and the method detailed. Results on plasma and comparison of the method with more conventional techniques are presented.

2648 (EUR-CEA-FC–1474, pp. 64-71) **The 110 GHz electron cyclotron heating and current drive system of Tore Supra.** Pain, M. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Berger-By, G.; Capitain, J.J.; Crenn, J.P.; Smits, F.; Tonon, G. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

Tore Supra is a super conducting toroidal field coils tokamak, allowing to conduct a research program oriented towards very long pulses. A 110 GHz electron cyclotron heating and current drive system is now being designed on Tore Supra, in order to study its potential as a current drive system on a future reactor, and more particularly its synergy with lower hybrid current drive. Although the sources required to generate large amounts of power (3 MW) are still under development, the simplicity of the antenna is still very attractive from the point of view of the installation in a reactor environment, where in-torus components are difficult to maintain. The Tore Supra ECRHCD system will consist of six gyrotrons expected to generate about 500 kW each under the TE_{64} mode. The gyrotrons will be fitted with cryogenic windows to allow the tubes to operate in a quasi-CW regime (pulse length 210 seconds). The transmission line will be a circular corrugated waveguide propagating the HE_{11} mode. This mode has been selected because its low losses and good polarization properties. A mode conversion chain will therefore be required between the gyrotron output and the transmission line. The antenna will have the capability of aiming at any point inside the plasma in the poloidal plane and to launch the beams with an angle in the toroidal plane up to 30 deg.

2649 (EUR-CEA-FC–1474, pp. 72-86) **Power combiners for incoherent waves.** Smits, F.M.A. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. 1993. (CONF-9210300–: EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating, Gut Ising (Germany), 19-21 Oct 1992). In *Euratom - CEA Association Contributions to the EC - 8 joint workshop on electron cyclotron emission and electron cyclotron resonance heating.* 86p. Order Number DE94604987. Source: OSTI; NTIS (US Sales Only); INIS.

Far and near future ECH applications need an increasing amount of injected power. The total power demand goes far beyond the power capacity of a single source. Usually, the power of every source is transported independently to the torus. This leads to complicated transmission and launching systems, it would be advantageous to combine the power of several sources into a single transmission line. Two high frequency waves with a small frequency difference are applied to a rectangular oversized waveguide and free space waves. The combiner exhibits cosinus-like filter characteristics and can simultaneously be used as a waveguide switch. Four combiner systems in free space waves (Gaussian beams) are discussed, which are of importance for ECRH applications: A system using asymmetrical gratings with two diffraction orders; a system using symmetrical gratings with four diffraction orders; a system using two symmetrical gratings with two diffraction orders in conical mount, and the system in conical mount folded around its symmetry axis. Sinusoidal grating parameters have been determined for the asymmetrical grating in TE-polarization, and for the conical grating in TE- and TM-polarization. For the conical grating, parameters even exist for which both TE- and TM- polarization are combined by the conical combiner.

2650 (GA-A–21413) **Evidence from modulated ECH for convective-like transport.** Luce, T.C. (General Atomics, San Diego, CA (United States)); Forest, C.B.; Petty, C.C.; Makowski, M.A.; Meyer, W.H.; de Haas, J.C.M.; Janicki, C. General Atomics, San Diego, CA (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-9308183–1: Workshop on local transport studies in fusion plasmas, Varenna (Italy), 30 Aug - 3 sep 1993). Order Number DE94001214. Source: OSTI; NTIS; INIS; GPO Dep.

A theoretical understanding of cross-field transport in magnetized plasmas remains elusive despite enormous effort. In part, this is due to the absence of a diagnostic which measures directly a transport coefficient, such as energy diffusivity. One obvious technique to observe transport is to impose a perturbation and observe the dynamic response of the plasma. Modulated electron cyclotron heating (ECH) is ideal for probing energy transport since it can be well-localized in space and time, and the energy is deposited into the thermal electrons on a time scale much shorter than the characteristic transport time scales. Coherent addition of periodic perturbations by Fourier analysis allows detection of perturbations down to the 1 eV level. Use of Fourier techniques also lessens the computational difficulties by reducing the equations back to ordinary differential equations, assuming that the transport coefficients are not functions of time. This simplification of the model also leads to a better conceptual understanding of the capabilities of the technique through the development of analytic solutions in limiting cases.

2651 (INIS-mf–13714) **Proceedings of the 16th symposium on plasma physics and technology.** Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. 356p. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Among 53 papers collected in the proceedings, 28 papers deal with the theory and modelling (8 papers), experimental research (11 papers) and diagnostics of high-temperature plasmas. These include lower hybrid current drive in tokamaks, plasma heating by electron beams, laser plasma interaction and z-pinch experiments. In the diagnostic papers, attention is mostly paid to X-ray and optical plasma spectroscopy and to advanced Langmuir probe diagnostics. The remaining papers discuss low-temperature plasmas and their applications. In this group, 8 papers deal with low-pressure electric discharges, 5 papers with high-pressure arcs, glidarcs and plasma torches, and 12 papers with various plasma technology topics, such as thin film deposition, plasma spraying and plasma chemistry. (J.U.).

2652 (INIS-mf–13714, pp. 1-7) **Diffusion of alpha particles induced by LHW.** Krlin, L. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Pavlo, P. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu.

[1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Recently a new mechanism was proposed by Fisch and Rax which should lead to amplification of lower hybrid (LH) waves at the expense of alpha particle energy, thus improving the LH current drive efficiency. The present contribution investigates the possibility of achieving the conditions on which this mechanism - based on the spatial diffusion of fusion alpha particles - could become operative. The analysis performed shows that in reactor grade tokamaks, the penetration of LH waves into the plasma column is very poor due to the intense electron Landau damping and the complex geometry of the equilibrium magnetic fields. Consequently, at acceptable LHW input power levels, the waves do not reach the regions where fusion alpha power could reasonably compensate the losses of LHW energy due to the damping by electrons. The model of Fisch and Rax is based on special features of the induced diffusion of alpha particles in the energy configuration space. Using suitable Hamiltonian formalism, the LHW-induced radial diffusion of alpha particles and the energy transport between LHW and alpha particles in the frame of generalized quasilinear lines of diffusion constraint, is also investigated. (author) 2 figs., 11 refs.

2653 (INIS-mf–13714, pp. 8-13) **On the role of short wavelength part of the spectrum in the LHW absorption by alpha particles.** Klima, R. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Krlin, L.; Pavlo, P. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Since the basic mechanism for lower hybrid current drive in tokamaks is the Landau absorption of lower hybrid waves (LHW) by fast electrons, any absorption of LHW by ions is undesirable. From this point of view, in reactor grade plasmas the fusion-born alpha particles with an energy of 3.5 MeV are very dangerous. Recent theoretical studies which have shown that the influence of alphas can be acceptably minimized by choosing a sufficiently high LHW frequency, did not account for the well-known short-wavelength part of the real LHW spectrum. In the paper, the nonlinear interaction of the full LHW spectrum with alphas is studied numerically for the ITER plasma parameters. In the computer model used, the ASTRA code is extended by two original codes which include ray tracing, absorption by electrons, the consequent current drive, and quasilinear absorption of LHW by alphas. (J.U.) 5 figs., 8 refs.

2654 (INIS-mf–13714, pp. 14-26) **Interaction of the slow lower hybrid waves radiated from a waveguide structure and the ponderomotive effects.** Preinhaelter, J. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Hurtak, O. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Ponderomotive effects of radiation when launching slow lower hybrid waves into a plasma are studied numerically. Four dominant waves of the spectrum of a conventional grill are taken into account in calculations of the resulting plasma density modulation. In the mathematical model used, the theory of a long waveguide structure is combined with the nonlinear theory of wave propagation in a plasma. Full consistency of the solution is ensured by using a modified Newton iteration in a shooting and matching method. The theory is applied to the conventional grill installed at the Asdex tokamak. The behavior of the launching structure predicted in the previous models is confirmed. It is shown that in addition to influencing the coupling conditions, the ponderomotive effects may cause redistribution of power between individual modes in the launched spectrum. (J.U.) 10 figs., 19 refs.

2655 (INIS-mf–13714, pp. 27-40) **Modelling of macroscopic plasma motions in the REBEX machine.** Ullschmied, J. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Clupek, M. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Non-linear non-stationary oscillations of a magnetized plasma column, the driving force of which is the transient kinetic and magnetic pressure produced by the injection of a high-current electron beam, are modelled on the basis of the numerical solution of the equation of plasma boundary motion. The results of the computations are used in the interpretation of diamagnetic, optical and neutral-particle measurements at the REBEX machine. (author) 10 figs., 23 refs.

2656 (INIS-mf–13714, pp. 41-51) **Relativistic electron beam scattering induced by magnetic field discontinuity.** Vrba, P. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The generation and propagation of a relativistic electron beam through a thin foil into a plasma column was studied numerically. Two types of electron scattering on the anode foil were compared: multiple scattering of fast electrons on atomic nuclei, and the scattering that arises when the magnetic field lines are discontinuous on the vacuum-plasma boundary. It is pointed out that these two types of scattering strongly affect the excitation of the two-stream instability. (author) 1 tab., 9 figs., 6 refs.

2657 (INIS-mf–13714, pp. 52-56) **Theory and simulations of ultrashort-pulse laser-plasma interactions.** Drska, L. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Limpouch, J.; Liska, R.; Sinor, M.; Vondrasek, J.; Andreev, A.A. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The interaction of femtosecond laser pulses with solid-state targets is investigated both analytically and numerically. The analytical model developed describes the absorption of laser radiation in the transitional region ranging from normal to anomalous skin effect. The model makes it possible to estimate the efficiency of laser energy conversion to X-ray radiation. It exploits a simulation code based on the solution of the Vlasov-Fokker-Planck equation for the electron distribution function, which is relevant to the regimes of both normal and anomalous skin effect. The results of simulations of laser-plasma interaction in the regimes of anomalous skin effect show that the plasma-vacuum boundary is modified approximately to the Langdon form, while the electron distribution differs substantially from the published theoretical model. (J.U.) 2 figs., 7 refs.

2658 (INIS-mf–13714, pp. 62-69) **Ultrasoft X-ray spectrometer for light impurities research in tokamak plasmas.** Piffl, V. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Raus, J.; Krejci, A.; Golubev, A.V.; Platonov, Yu.Ya.; Pina, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma*

physics and technology. 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A time resolved four-channel spectrometer with an absolutely calibrated response was developed at the Institute of Plasma Physics. Each adjustable channel of the spectrometer combines a thin film prefilter, a layered synthetic microstructure diffractor, and a suitable detector - a channeltron with a metal photocathode and magnetic field shielding. The main objective is to perform an absolute measurement of the content of impurities in tokamak plasmas. Dispersive properties of the apparatus are appointed for alignment to individual spectral lines to determine plasma parameters and the fraction of light impurities (C, B, O). The dominant spectral features of H-like and He-like ions of these elements are located in the spectral region 200-800 eV which has not been sufficiently covered by spectroscopic tools already used in tokamak studies. Basic information concerning the design, manufacturing and scope of the spectrometer is given. (author) 3 tabs., 3 figs., 2 refs.

2659 (INIS-mf–13714, pp. 70-72) **Oscillation technique for T_e-measurements by Langmuir probe on the CASTOR tokamak.** Stoeckel, J. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Kryska, L.; Zacek, F. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The oscillatory probe method described is based on measurements of the potential drop arising from a superimposition of a modulating voltage to the floating Langmuir probe. The oscillatory method makes it possible to overcome several principal disadvantages of the standard techniques. It has been used for strictly local measurements of electron temperature in the edge region of the Castor tokamak. Preliminary results are presented and further application possibilities of the method are discussed. (J.U.) 2 figs., 3 refs.

2660 (INIS-mf–13714, pp. 73-76) **Laser blow-off accelerated micropellets for plasma diagnostics.** Veres, G. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics); Zoletnik, S.; Kalvin, S.; Bakos, J.; Ignacz, P.; Kardon, B. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The impurity injection technique is a useful tool for the investigation of many plasma properties. To study quick processes with good temporal and spatial resolution, a bunch of impurities is neede, well localized both in space and time. Micropellets ranging from 10 to 100 μm size and 0.1 to 10 km/sec velocity are very suitable for this. A new pellet acceleration method is reported using aluminium powder of approx. 100 μm granule size. The powder is glued with synthetic glue to the surface of a glass disc. The disc is then fired from the opposite side with an intense laser pulse and the pellets get free from the glass surface. Also presented are some results of the experimental investigation of the toroidal transport of injected impurities in the MT-1M tokamak plasma using the new pellet injector. (author) 1 tab., 2 figs., 2 refs.

2661 (INIS-mf–13714, pp. 77-81) **New acquisition system for fusion experiment: Slow variable transients.** Bielik, M. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A new data acquisition system, insensitive to electromagnetic interference signals, was developed for plasma focus experiments. It is provided with a full fiber optic separation between signal sources and a data processing system located in a Faraday cage. Slowly variable input signals are processed using a pulse frequency modulation method. The capacity of the multiplexer used permits switching of 16 analog signals. Main characteristics of the system, the electric schemes of its key parts, and the results of its testing are described in detail. (J.U.) 1 tab., 4 figs., 5 refs.

2662 (INIS-mf–13714, pp. 82-87) **Apparatus for recording spectral line wings by intracavity dye laser spectroscopy.** Ripa, M. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Kolacek, K.; Clupek, M. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

To achieve a better time resolution in measurements of profiles of plasma emission lines by means of an intracavity laser spectroscopy method, a new dye laser pumped by the second harmonic of a Q-switched Nd:YAP laser has been built. The laser part of the apparatus, which consists of a laser generator, amplifier, second harmonic generator and a dye laser, is described in detail, and the results of measurements of the laser output energy (typically 30 mJ/70 ns) are presented. As for the detection part, the diffraction-grating spectrograph tested earlier will be used, in combination with an upgraded digital readout system, the key part of which will be a triggerable CCD camera. (J.U.) 3 figs., 11 refs.

2663 (INIS-mf–13714, pp. 88-92) **Application of thermoluminescent dosemeters in laser-produced plasma diagnostics.** Juha, L. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Physics); Pietrikova, M.; Krasa, J.; Masek, K.; Kralikova, B.; Skala, J. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A new application of thermoluminescent dosemeters in hot plasma diagnostics is demonstrated, based on numerical analysis of the glow curves. By decomposing the glow curves, the parameters of single glow peaks corresponding to various activation energies in the dosemeter can be determined. The ratio of heights of the peaks depends on the energy of the absorbed photons. It is shown that the known dependence of the peak height ratio on the photon energy can be used for estimates of the mean photon energy of the absorbed soft X radiation within the range 1 - 22 keV. (J.U.) 4 figs., 5 refs.

2664 (INIS-mf–13714, pp. 93-99) **The use of an elliptical analyzer spectrograph for characterization of LPP X-ray emission.** Renner, O. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Physics); Kopecky, M.; Krousky, E.; Foerster, E.; Hoelzer, G. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Due to its favorable characteristics briefly surveyed in the paper, an elliptically bent crystal was chosen for an X-ray spectrograph applied to a laser-produced plasma. By using a ray-tracing optimization procedure, a simple and compact instrument was designed with a crystal of mica bent over the surface of two elliptically shaped mounting blocks. The instrument was successfully tested in interaction experiments at the iodine photodissociation laser system Perun. Some results of these experiments are presented. It is demonstrated that the spectrograph may be used for high resolution X-ray spectroscopy in a relatively broad energy range. (J.U.) 4 figs., 5 refs.

2665 (INIS-mf–13714, pp. 100-102) **Possible role of the inverse Faraday effect in plasmas.** Kalal, M. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FARADAY EFFECT/laser-produced plasma; LASER-PRODUCED PLASMA/magnetic fields; LASER RADIATION; POLARIZATION

2666 (INIS-mf–13714, pp. 103-105) **Optical diagnostics of inductively coupled plasma.** Ahmad, I. (T.G. Masaryk University, Brno (Czech Republic). Faculty of Science); Kapicka, V.; Petrakiev, A. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-FREQUENCY DISCHARGES/plasma diagnostics; PLASMA DIAGNOSTICS/emission spectroscopy; ARGON; NON-EQUILIBRIUM PLASMA

2667 (INIS-mf–13714, pp. 106-113) **Modern Fabry-Perot interferometer.** Brabec, A. (T.G. Masaryk University, Brno (Czech Republic). Faculty of Science); Stastny, F. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The Fabry-Perot interferometer was tested for stability in time and linearity, and with respect to its use in plasma diagnostics. The influence of the input diaphragm size and of the input monochromator slit width on the accuracy of interferometric measurements was studied. The tests were performed with the piezoelectrically scanned RC 150 Burleigh interferometer and with a cadmium tube as a testing light source. A high-accuracy computer-controlled A/D measuring system was used. The tests certified that the interferometer is stable within a period of 10 minutes. (J.U.) 9 figs., 8 refs.

2668 (INIS-mf–13714, pp. 114-120) **Dependence of particle confinement on plasma density and plasma position in LHCD discharges in CASTOR tokamak.** Badalec, J. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Kletecka, P.; Krycka, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

An enhancement of line average electron density was observed in the CASTOR tokamak when lower-hybrid power was launched into ohmic plasma. A broadening of the density radial profile was also found. Such behavior of density in lower hybrid current drive (LHCD) discharges can be attributed to an improvement of particle confinement. The dependence was investigated of the global particle confinement time on the plasma density and the position in the plasma. A simple model was used to evaluate the total number of particles in the plasma volume. The global particle confinement improved by a factor of 2-2.5 during LHCD. Further improvement of the global particle confinement was found in the plasma closer to the optimum. (author) 5 figs., 5 refs.

2669 (INIS-mf–13714, pp. 121-126) **Study of electron density profile in the CASTOR tokamak using a lithium beam.** Zacek, F. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Jakubka, K.; Badalec, J.; Stoeckel, J.; Kletecka, P.; Kryska, L.; Kriha, V. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

A diagnostic pulsed arc source of a Li beam was used to measure the electron density profile in front of the lower hybrid grill on the CASTOR tokamak. It was shown that this profile is modified significantly during lower hybrid wave application if the regime with improved particle confinement is achieved. (author) 4 figs., 8 refs.

2670 (INIS-mf–13714, pp. 127-131) **Role of runaway electrons in LHCD regimes with improved confinement on CASTOR tokamak.** Stoeckel, J. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Zacek, F.; Voitsekhovich, I. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Recent lower hybrid current drive (LHCD) experiments indicate that the reduction of edge plasma electrostatic fluctuations is responsible for the observed improvement of particle confinement in tokamaks at moderate lower hybrid powers. A possible explanation of this reduction is an enhanced population and non-ambipolar losses of runaway electrons during LHCD. This mechanism is demonstrated on the basis of a model which makes it possible to calculate the population and losses of runaway electrons. The model equations are solved using the 1-D Astra code. The experimental data obtained at the Castor tokamak, in particular the variations of the fluctuation level with LH power, are in good agreement with the theory at a reasonable choice of free model parameters. (J.U.) 3 figs., 7 refs.

2671 (INIS-mf–13714, pp. 132-136) **Mapping of the edge plasma in CASTOR tokamak.** Svoboda, V. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Sekar Iyengar, A.N.; Stoeckel, J.; Zacek, F.; Dhyani, V. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Spatially resolved measurements of edge plasma parameters in the Castor tokamak are reported. The experiments were focussed on determining the poloidal dependence of magnetic and electrostatic fluctuations. Both the Joule heating and lower hybrid current drive (LHCD) regimes investigated. Magnetic fluctuations were studied using a set of Mirnov coils, electrostatic fluctuations by means of a poloidal array of Langmuir probes. In both cases the correlation technique was used. The magnetic measurements indicated a suppressed MHD activity and an increase of poloidal velocity of fluctuations in LHCD regimes. The cross-correlation analysis of signals of the probe array showed a poloidal rotation of potential fluctuations, the velocity of which changed with the direction of the radial electric field. (J.U.) 6 figs., 4 refs.

2672 (INIS-mf–13714, pp. 137-145) **REB energy deposition in modified REBEX experiment.** Piffl, V. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Clupek, M.; Sunka, P.; Vrba, P. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The angular beam velocity spread of the injected relativistic electron beam in the REBEX machine reduced in order to achieve a higher plasma heating efficiency. For this purpose, the guiding

magnetic field in the diode region was increased to 1.5 T and ultrathin anode foils were used. Simultaneously, the length of the interaction region was shortened and a new plasma source with a transient reversed magnetic field was installed. In the experiments the beam energy deposition efficiency was calculated on the basis of measurements of local plasma diamagnetism. Both the single transit and the reflected beam regimes were studied. In the former case the energy deposition rate increased along the beam path in accordance with the theory, while in the latter the longitudinal profile of the deposited energy had a reversed slope and the overall beam deposition efficiency was up to 3 times higher. (J.U.) 8 figs., 7 refs.

2673 (INIS-mf–13714, pp. 146-150) **Ion emission from Al-laser-produced plasma.** Woryna, E. (Instytut Fizyki Plazmy i Laserowej Mikrosyntezy, Warsaw (Poland)); Kralikova, B.; Krasa, J.; Laska, L.; Masek, K. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Measurements are reported of ions emitted from a planar aluminium target irradiated by the first harmonics of the iodine laser system Perun. The energy and charge ion spectra and their angular distribution were investigated by means of planar ion collectors and cylindrical Langmuir probes. Several distinct ion groups were found: The highest yield is to be attributed to the thermal ion group driven by isothermal plasma expansion. The fast ion groups, which are likely to arise due to suprathermal electrons formed in the plasma corona, are emitted mainly in the normal direction to the target surface. In addition, the impurity effects give rise to a group of fast protons. (J.U.) 6 figs., 6 refs.

2674 (INIS-mf–13714, pp. 158-169) **In situ probe diagnostics of laser produced plasma.** Brcka, J. (Slovak Technical University, Bratislava (Slovakia). Microelectronics Department). Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Single Langmuir probe measurements were used in the investigation of time- and space-resolved plasma parameters during material removal from an aluminium target using the XeCl excimer laser. The arrival time of ions, the time-averaged expansion velocity, and the radial and axial dependences of ion density were studied for various pressures, laser fluences, and configurations of the experimental setup. The experimental results, the evaluation of parameters, and interpretation of the volt-ampere characteristics in the ion mode of the probe operation are presented. (J.U.) 6 figs., 24 refs.

2675 (INIS-mf–13714, pp. 170-172) **Interrupted z-pinch in argon.** Kubes, P. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Kravarik, J.; Hakr, J.; Pichal, J.; Kulhanek, P. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The pinch effect in a low-pressure discharge in air between two cone-shaped copper electrodes was investigated. The paraxial dense part of the z-pinch became interrupted due to the barrel shape of the magnetic and electric fields, and two relatively stable plasma jets, connected with the electrode tips, were formed in the discharge shortly after the breakdown. Later a high-density ellipsoidal structure with a sharp boundary formed. Michelson interferometry and the Schlieren method, respectively, were used in measurements of the plasma density in the discharge channel and in the small inhomogeneity regions. A distinct filamentary structure of the plasma jets was well seen in the Schlieren pictures. The electron temperature was calculated from the intensities of spectral lines and of continuum radiation in the visible region. (J.U.) 1 fig., 3 refs.

2676 (INIS-mf–13714, pp. 173-180) **Study of radiation of plasma used for steel nitride in dc and rf discharges.** Kulakovska-Pawlak, B. (Wroclaw Univ. (Poland)); Zynicky, W. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Optical emission spectroscopy was used in the study of the nitriding process of tool steel in DC and RF glow discharges in hydrogen-nitrogen gas mixtures. Main attention was paid to the excited active species in the gas phase, which promoted the nitriding process. The influence of hydrogen concentration in the gas mixture and of the steel surface temperature on the plasma composition and on relative densities of active species in the plasma was investigated and the differences in the reaction degrees in DC and RF discharges are discussed and explained. (J.U.) 1 tab., 5 figs., 9 refs.

2677 (INIS-mf–13714, pp. 189-198) **Langmuir probe measurement in the rf low pressure jet plasma-chemical reactor.** Jirutka, P. (Karlova Univ., Prague (Czech Republic). Fakulta Matematicko-Fyzikalni); Sicha, M.; Tichy, M.; Jastrabik, L.; Soukup, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The low pressure rf plasma jet system is suitable for many technological applications. The Langmuir probe can serve as a simple inexpensive diagnostic tool. A method is presented of solving the most difficult problem with rf discharge probe measurements: how to eliminate the disturbing rf voltage component between the plasma and the probe. Radial variations of probe characteristics measured by a cylindrical probe in a nitrogen rf plasma jet system are also presented. (author) 7 figs., 9 refs.

2678 (INIS-mf–13714, pp. 213-217) **The magnetron plasma optical diagnostics.** Hanitz, F. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Elektrotechnicka); Lego, J.; Pekarek, S.; Rosenkranz, J. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The basic plasma parameters of a planar magnetron discharge in an argon plasma, used for deposition of titanium thin films, were studied by a spectroscopic method. In determining the electron temperature, the dependence of the ionized argon and neutral titanium lines on the excitation potential was used. The rate of titanium and neutral argon atoms was determined from the rates of intensities of the neutral titanium and neutral argon lines. Based on these measurements, the total density of titanium atoms and their velocity at the target are calculated. The experimental results are compared with a simple model of the magnetron discharge plasma. (J.U.) 3 tabs., 2 refs.

2679 (INIS-mf–13714, pp. 225-229) **Macroscopic model of streamer.** Trunec, D. (T.G. Masaryk Universtity, Brno (Czech Republic). Faculty of Science); Davies, A.; Niessen, W. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the*

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A three-dimensional fluid model of a streamer is described, which is based on the assumption that the charge carriers are in local thermal equilibrium so that the discharge may be described by a set of continuity equations together with the Poisson equation and with appropriate boundary conditions. Calculations are carried out for a rotationally symmetric, 5 mm wide, air-filled parallel-plate gap at atmospheric pressure. The model predicts both longitudinal and lateral motions of electron and ion swarms and thus accounts properly for such effects as radial diffusion and focusing. (J.U.) 3 figs., 6 refs.

2680 (INIS-mf–13714, pp. 230-235) **Spectroscopic measurements of GLIDARC plasma chemical reactor.** Sember, V. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Svoboda, P. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The GLIDARC plasma chemical reactor is suited for the destruction of halocarbon wastes. To better understand its high destruction efficiency, the emission spectra of the discharge were measured. The experiments consisted in the generation of a low current (100 mA) discharge under atmospheric pressure in Ar-H_2-O_2 mixtures. The movement of the discharge was studied by an optical method. The near-UV and visible emission spectra measured by means of the OMA spectroscopic apparatus are presented. Relative intensities and profiles of argon oxygen and hydrogen atomic lines were used to calculate the mean excitation temperature and electron density. (author) 8 figs., 4 refs.

2681 (INIS-mf–13714, pp. 236-242) **Application of electric probes for study of structure of thermal plasma jet.** Hrabovsky, M. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Kopecky, V. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The structure and the shape of a thermal plasma jet generated by a plasma torch with a water stabilized arc was investigated using electric probes. The plasma shape was reconstructed from the measured ion currents to two negatively biased wire probes movable across the jet. The frequency and the amplitude of the probe voltage oscillations provided information on the structure of plasma inhomogeneities at a given point. The velocity of the inhomogeneities could be calculated on the basis of a statistical analysis of signals from two probes located at different axial positions. (J.U.) 5 figs., 6 refs.

2682 (INIS-mf–13714, pp. 243-251) **Investigation of thermal plasma jet generated by plasma torch with stabilized arc.** Hrabovsky, M. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Plasma Physics); Kopecky, V.; Sember, V. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Basic parameters of a plasma jet generated by a water stabilized plasma torch were investigated using calorimetric, electric probe and spectroscopic methods. The radial profiles of plasma velocities, the total mass flow rate, and the momentum and heat flux rates to the injected spherical particles were determined on the basis of computed equilibrium thermodynamic and transport properties of a water plasma. The plasma temperatures and axial plasma velocities were found to be higher than values published for gas torches. The resulting high rates of heat flux to the dragged particles may be the cause of the well known high spraying efficiency of water plasma torches. (J.U.) 2 tabs., 6 figs., 12 refs.

2683 (INIS-mf–13714, pp. 252-258) **Prediction of radiative heat transfer in the arc plasmas.** Aubrecht, V. (Vysoke Uceni Technicke, Brno (Czech Republic)); Bartl, J.; Gross, B.; Peska, L. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The approximate method of partial characteristics is applied to the prediction of the radiation intensity and of the radiation flux density and its divergence in the sulphur hexafluoride arc plasma. Using precalculated tables of the partial characteristics, it is possible to determine the parameters of the radiative flux for an arbitrary plasma geometry, simply integrating over angles. The method gives an agreement with exact calculations to within 20 per cent, and a considerable reduction of computation time by about four orders of magnitude. (J.U.) 6 figs., 9 refs.

2684 (INIS-mf–13714, pp. 324-329) **Characterization of microwave plasma generated in inhomogeneous magnetic field.** Misina, M. (Czech Academy of Sciences, Prague (Czech Republic). Institute of Physics); Musil, J. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

The electron cyclotron resonance (ECR) argon discharge in a decreasing magnetic field was investigated using thin and thick electric probes The pressure was varied between 0.9 and 90 Pa, and the absorbed microwave power from 50 to 400 W. The influence of the substrate holder on plasma microparameters was studied. The experiments showed that measurements with a thin probe do not give correct results in the presence of the substrate holder. The position of the substrate holder proved to be crucial for achieving a good reproducibility of thin film processing. The ECR absorption dominates at pressures below 1 Pa, while at pressures above 90 Pa mainly collisional absorption contributes to plasma generation. (J.U.) 5 figs., 9 refs.

2685 (INIS-mf–13714, pp. 348-352) **New possibilities of multilayer X-ray optics application to plasma diagnostics.** Grudsky, A. (Seifert-Roentgen and Ko A/O, St. Petersburg (Russian Federation)); Platonov, Yu.; Shmaenok, I. Ceske Vysoke Uceni Technicke, Prague (Czech Republic); Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. [1993]. (CONF-9304218–: 16. symposium on plasma physics and technology, Prague (Czech Republic), 27-29 Apr 1993). In *Proceedings of the 16th symposium on plasma physics and technology.* 356p. Order Number DE94604181. Source: OSTI; NTIS (US Sales Only); INIS.

Based on recent achievements in multilayer optics, a new spectral channel for time-resolved X-ray plasma diagnostics was developed. The results of testing a new binary dispersion element are presented, in which a germanium crystal was used as a crystal analyzer and simultaneously as a substrate for Ni-C multilayer structure. The applicability of the technique is demonstrated by the results obtained with the module-type 11-channel X-ray polychromator used at the laser plasma experiment in the IPP FOM Institute in Holland. (J.U.) 3 figs.

2686 (INIS-mf–13724) **Determination of the plasma column shape in the Tokamak Novillo cross section by magnetic probes.** Hernandez Omana, A. Universidad Autonoma Metropolitana, Mexico City (Mexico). Unidad Azcapotzalco. 1993. 77p. (In Spanish). Order Number DE94604986. Source: OSTI; NTIS (US Sales Only); INIS.

The determination of plasma cross section shape in Tokamaks is an important diagnostic method for equilibrium conditions analysis. In this work, it is obtained a time dependent variation of the plasma column cross section in Novillo Tokamak. The experimental method

is based on using one magnetic probe, which is installed inside of the vacuum vessel in a 1 mm. wall thickness stainless steel tube, in the protected region of the limiter shadow. The plasma column cross section is determined measuring the poloidal magnetic field produced by the plasma current. This method, now running for determining the plasma column shape, requires the measurement of magnetic present field outside plasma column. The measurements are carried out from a set of small coils, which are located inside the vacuum chamber in the radial and poloidal direction, so we can measure magnetic field with no current attenuations produced by the penetration time of the stainless steel vacuum chamber. The magnetic probe detect a real time variation of magnetic flux passing through them. In order to obtain the magnetic field values, it is required that the electric signals coming from the magnetic probe be integrated, this operation is carried out by active circuits located between the probe signal and one oscilloscope. The integrated signals can be exhibited photographed on the oscilloscope display. (Author).

2687 (INIS-mf–13731, pp. 30) **Detection of anomalous nuclear effect in deuterium/solid systems using CR-39.** Li Xingzhong (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Mo Dawei; Zhang li; Wang Shicheng; Kang Tiesun. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/cold fusion; DEUTERIUM; PALLADIUM; SOLIDS

2688 (INIS-mf–13731, pp. 156) **Measurement of fluences and energy of D^+ emitted from plasma focus in capacitor bank energies interval of 1-30 KJ.** Antanasijevic, R.; Lakicevic, I.; Popovic, S.; Zaric, A.; Sevic, D.; Vukovic, J.; Konjevic, D. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEUTERIUM IONS/dielectric track detectors; DEUTERIUM IONS/plasma focus; ANGULAR DISTRIBUTION; CAMERAS; CAPACITORS; ENERGY; PARTICLE TRACKS; PLASMA DIAGNOSTICS

2689 (INIS-mf–13731, pp. 267) **Energy study of accelerated ions from a dense plasma focus by means of CR-39 track detector.** Castillo, F. (Instituto de Ciencias Nucleares, Mexico, D.F. (Mexico)); Herrera, J.J.E.; Espinosa, G. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ION BEAMS/acceleration; ION BEAMS/energy spectra; PLASMA FOCUS/acceleration; DIELECTRIC TRACK DETECTORS; ELECTRODES; ACCELERATION; PROTONS

2690 (JINR–15-92-375) **Chain reaction of nuclear fusion.** Zorin, G.N.; Vorob'ev, E.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 23p. (In Russian). Order Number DE94606807. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Fusion.

The mechanism for generation of intensive fields of monoenergetic neutrons, neutrino fields and for beams production of the directional coherent X-radiation with the help of nuclear pumping without using nuclear explosion is elaborated with the use of the established new physical phenomenon - thermonuclear neutron multiplication by fission fragments. A fundamentally new scheme of a fusion reactor on deuterium is discussed. 6 refs.; 4 figs.; 3 tabs.

2691 (JINR-D–15-92-323) **Investigation of nuclear fusion reactions in charge-nonsymmetric muonic molecules.** Belyaev, V.B. (and others); Bertin, A.; Bystritskij, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 14p. Order Number DE94606806. Source: OSTI; NTIS (US Sales Only); INIS.

The project presents an experimental programme on the study of fusion of light nuclei (h, He, Li, Be) in charge-nonsymmetric muonic molecules $HeH\mu$, $LiH\mu$, $BeH\mu$ (H is p, d, t). The project describes techniques, conditions of experiments on the study of nuclear fusion reactions in muonic molecules $^{3,4}HeH\mu$, $^{6,7}LiH\mu$. These are also limiting estimations of nuclear fusion rates, which can be obtained in the experiments. For this experimental programme the intensive muon beams are required. 18 refs.; 4 figs.

2692 (LA-UR–93-3502) **A moving finite element model of the tokamak scrapeoff layer.** Glasser, A.H.; Kuprat, A.P. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931070–1: 4. international workshop on plasma edge theory in fusion devices, Varenna (Italy), 4-6 Oct 1993). Order Number DE94000673. Source: OSTI; NTIS; INIS; GPO Dep.

Most numerical simulations of the tokamak scrapeoff layer use a mapping to flux coordinates and a piecewise equidistributed grid in those coordinates to resolve the multiple length scales and anisotropy characteristic of this problem. We have developed an alternative numerical method using simple cylindrical coordinates with a complex adaptive grid scheme. It is based on an understructured grid of traingles which move adaptively, aligning themselves with the magnetic field and concentrating in regions of sharp gradients.

2693 (LRP–462/92) **Invited and contributed papers presented at the joint Varenna-Lausanne international workshop on 'theory of fusion plasmas.** Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP). Aug 1992. 36p. (CONF-920813–: Joint Varenna-Lausanne international workshop on theory of fusion plasmas, Varenna (Italy), 24-28 Aug 1992). Order Number DE93614568. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2694 (NIFS–167) **A triggering mechanism of fast crash in sawtooth oscillation.** Watanabe, K.; Sato, T. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 18p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992). Order Number DE94718974. Source: OSTI; NTIS; INIS.

Full-torus, compressible, resistive MHD simulations have been performed to study the mechanism of fast crash in the sawtooth oscillation. The simulation results reveal that the q value, which at first decreases in accordance with current peaking subject to ohmic heating, starts increasing in the $q < 1$ region due to strong excitation of nonlinear modes and becomes flattened. When the q profile is flattened in the $q < 1$ region, the plasma flow pushes the magnetic surface radially outwards and the poloidal magnetic field lines are driven to reconnect rapidly with each other across the q=1 surface. Consequently, the central hot plasma is pushed out towards the wall to crash its confinement. It turns out that the m=1 plasma flow induced by the kink instability, rather than the pressure gradient, plays a decisive role in the crash process. (author).

2695 (NIFS–170) **K_ϵ model of anomalous transport in resistive interchange turbulence.** Sugama, H.; Okamoto, M.; Wakatani, M. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 17p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992). Order Number DE94718983. Source: OSTI; NTIS; INIS.

A K_ϵ anomalous transport model for resistive interchange turbulence is presented and applied to the transport analysis of ECH plasmas in Heliotron E. In this model, the turbulent kinetic energy $K \simeq 1/2 < \upsilon \text{ tilde}^2 >$ and its viscous dissipation rate ϵ characterize the local turbulence and the anomalous transport coefficient is given by $D \approx K^2/\epsilon$, which has some nonlocal properties not included in the conventional expressions since their temporal and spatial variations are determined by taking into account the transport of the turbulent energy itself. In the case of the homogeneous turbulence where the anomalous transport may be described in

terms of the local plasma parameters, the dimensional analysis applied to our model yields the two types of local parameter expressions of the anomalous diffusivity in the high and low collisional cases. We find a familiar diffusivity for the resistive interchange turbulence derived in the high collisional case and we have another one similar to the gyro-reduced Bohm (GRB) diffusivity in the low collisional case. However, it is shown from the transport simulation using our model that, in the region where the turbulence inhomogeneity is significant, the anomalous diffusivity deviates from the local parameter expression due to the transport terms in the K_ϵ equations. Our model explains the experimental results consistently in that it gives the GRB or LHD scaling for the energy confinement time and reproduces the experimentally obtained profile of the anomalous diffusivity which has large values in the peripheral region in contrast with the GRB model. (author).

2696 (NIFS–176) **Improved models of β-limit, anomalous transport and radial electric field with loss cone loss in Heliotron/torsatron.** Itoh, K.; Itoh, S.; Sanuki, H.; Ichiguchi, K.; Todoroki, J.; Fukuyama, A. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 15p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/C-1-4). Order Number DE94718976. Source: OSTI; NTIS; INIS.

Theoretical study is made on the physics mechanisms which determine the beta-limit, the anomalous transport, and the radial electric field and loss cone. New theory is developed to analyze the stability boundary against the interchange mode in high-aspect-ratio toroidal helical plasmas, taking into account the transport processes. The stability β-limit is given at finite β-value, and the dependences on the plasma parameters and on the transport coefficient are investigated. It is found that the current-diffusive interchange mode is more important than the resistive mode in hot plasmas. The β-limit is predicted in the range of experimental observation for the anomalous transport. The dynamics of the pressure gradient and mode amplitude around this stability boundary are analysed. As the heating power is increased, the dynamics changes from the monotonous saturation, through the saturation with overshoot, and to the sawtoothing. Using the mean-field theory approach of statistical physics for the microscopic current-diffusive interchange mode, the anomalous transport theory is developed. The expression of the thermal transport coefficient is obtained. The pressure gradient, not the temperature itself, enhances the transport coefficient. Comparison with experimental observations from various aspects is made, and the model explains experimental observations. The method to obtain the self-consistent picture of the radial electric field E_r and the loss cone loss is explored. The structure of E_r and the loss cone are obtained, and it is confirmed that the direct ion loss makes E_r near edge more negative. Effects of other nonclassical loss are also evaluated. (author).

2697 (NIFS–179) **New features of L-H transition in limiter H-modes of JIPP T-IIU.** Toi, K. (and others); Morita, S.; Kawahata, K. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 15p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992). Order Number DE94718980. Source: OSTI; NTIS; INIS.

In limiter H-modes of JIPP T-IIU, a new type of L-H transition preceded by an ELM is observed. The preceding ELM (pre-ELM) appears just prior to the L-H transition. This type of transition is usually observed in H-modes of JIPP T-IIU. The L-H transition without the pre-ELM is triggered only in the case when a sufficiently large rapid current ramp down is emploied. In H-modes with constant $q(a) \approx 3.5\text{-}4.5$, coherent magnetic oscillations with m=3/n=1 destabilized during L-phase are further enhanced at the pre-ELM, and suppressed suddenly at the transition. This mode is situated in the region of the transport barrier. Propagation frequency of the m=3/n=1 mode, which may be affected by plasma mass rotation, rises appreciably (by $\approx$ 10 %) during H-phase with frequent ELMs, but remains unchanged for at least 200 μs after the transition. Behaviours of the m=3/n=1 and m=2/n=1 modes are well explained by quasi-linear resistive tearing mode analysis for modelled toroidal current density profiles slightly detached from the limiter. These experimental results suggest that the transition is controlled by the change of a magnetic field structure relating to the modification of a toroidal current density profile near the edge. The possibility for the development of edge radial electric field as a consequence of the transition is discussed. (author).

2698 (NIFS–181) **The new features of Ion Bernstein Wave Heating in JIPP T-IIU tokamak.** Watari, T. (and others); Kumazawa, R.; Seki, T. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 16p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/E-2-3). Order Number DE94718978. Source: OSTI; NTIS; INIS.

Ion Bernstein Wave Heating experiment was conducted in JIPP T-IIU tokamak. A relatively high frequency, 130 MHz, was used to reduce impurity influx and IBW power up to 400kW was injected without plasma disruption. It was found that the radial profiles of electron density, electron temperature, and ion temperature are all peaked during the IBWH. It was also found that ion distribution function does not have high energy tail above certain critical energy. These are favorable and useful features in optimizing fusion reactivity in reactor applications. (author).

2699 (NIFS–184) **Heating experiments using neutral beams with variable injection angle and ICRF waves in CHS.** Okamura, S. (and others); Nishimura, K.; Hanatani, K. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 16p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992). Order Number DE94718982. Source: OSTI; NTIS; INIS.

Confinement of ripple-trapped energetic ions is studied in a low-aspect-ratio helical system using a neutral beam with variable injection angle. The heating efficiency was found to be very low for the perpendicular injection compared with the tangential one, in the magnetic field configuration which is optimized for the global confinement for the tangential NBI plasmas. Confinement of beam ions was improved by shifting the magnetic axis inward, which was confirmed by the measurement of their energy spectrum. The results are consistent with the calculation of Monte Carlo beam-ion-thermalization code. The poloidal rotation near plasma edge is measured for different injection angles which shows larger value for the perpendicular injection. The fast wave ICRF heating is applied to a low-aspect-ratio helical system. Substantial energy increase is obtained for the NBI target plasma. High energy ion tail is observed in the limited range of pitch angles. (author).

2700 (NIFS–185) **MHD and confinement characteristics in the high-β regime on the CHS low-aspect-ratio heliotron/torsatron.** Yamada, H. (and others); Morita, S.; Ida, K. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 15p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992). Order Number DE94718981. Source: OSTI; NTIS; INIS.

The MHD and confinement characteristics associated with the finite-β effect have been investigated in the low-aspect-ratio heliotron/torsatron Compact Helical System (CHS). $<\beta>$ values of 1.8% in the quasi-steady state and 1.9% in the transient phase have been realized and β_0 has reached 5.8%. The experimentally observed equilibrium characteristics are in good agreement with current 3-D analysis. Significant instabilities suppressing β value or terminating the discharges have not yet been observed in standard operation. This is supposed to be due to self-stabilization of the ideal interchange mode by spontaneously generated magnetic wells, which is a distinguishing feature of the low aspect ratio. Magnetic fluctuations with the frequency range less than 100 kHz have reached as much as 0.1% of the poloidal equilibrium field. The predominant modes are globally coherent with the low mode number and do not affect confinement. The scaling of β follows the prediction from LHD scaling. The thermal diffusivity depends on the local scale length of β, the characteristics of which is emphasized for the magnetic hill region. The present β value is limited by saturation of confinement with increasing density and degradation of confinement with increasing power rather than by MHD characteristics. (author).

2701 (NIFS–187) **Model of the L-mode confinement in tokamaks.** Itoh, K.; Itoh, S.; Fukuyama, A.; Yagi, M.; Azumi, M. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 14p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/H). Order Number DE94718986. Source: OSTI; NTIS; INIS.

Model of the L-mode confinement in tokamaks is developed based on the microscopic ballooning mode instability. The anomalous transport coefficients determine the stability below the critical beta against the ideal MHD ballooning instability. The current-diffusivity has strong destabilizing effect, while the thermal transport χ and ion viscosity tend to stabilize the mode. The stability boundary for the least stable microscopic ballooning mode determines the anomalous transport coefficients. The obtained formula is compared with experimental observations on the L-mode confinement. The predictions on (1)the radial shape of χ, (2)the temperature-profile resilience, (3)the global confinement characteristics, such as the power degradation and the dependences on the plasma current, current profile and mass number, and (4)the ratio of the perturbative χ to the energy balance χ are consistent with experimental database. (author).

2702 (NIFS–198) **Formation of H-mode like transport barrier in the CHS heliotron/torsatron.** Toi, K. (and others); Okamura, S.; Iguchi, H. National Inst. for Fusion Science, Nagoya (Japan). Oct 1992. 16p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/H-1-3). Order Number DE94718984. Source: OSTI; NTIS; INIS.

Control of rotational transform profile with a small ohmic heating (OH-) current to increase the rotational transform has led to a continuous rise in the line-averaged electron density with reduction of $H\alpha$-lights around the torus, in a heliotron/torsatron plasma heated by neutral beams. During the density rise, the transport barrier with steep temperature and density gradients near the plasma edge has been formed. Edge localized modes (ELM)-like activity is also observed. Incoherent magnetic fluctuations in the frequency range $f > 20$ kHz are clearly suppressed during the density rise phase, while low frequency coherent part remains almost unchanged. Global energy confinement time in the density rise phase is improved by ≈ 15 %, compared with that of the discharge without the OH-current. These experimental observations are very similar to the H-mode in tokamaks. There is a threshold of the current for the transition, where the increment of rotational transform by the threshold current corresponds to ≈ 0.1 at the edge. No obvious increase in the edge poloidal rotation velocity, however, is observed during the density rise phase, that is, at most ≈ 3 km/s. (author).

2703 (NIFS–215) **Thickness of the layer of strong radial electric field in JFT-2M H-mode plasmas.** Ida, K.; Itoh, K.; Itoh, S.; Miura, Y.; Fukuyama, A. National Inst. for Fusion Science, Nagoya (Japan). Apr 1993. 23p. Order Number DE94718993. Source: OSTI; NTIS; INIS.

The poloidal rotation velocity profiles both in L- and H- mode measured in JFT-2M are compared with H-mode models based on ion orbit loss. The profiles of poloidal rotation velocity measured in L- and H-mode is consistent with the calculation which consists of ion orbit loss. The dependence of the thickness of the layer of high shear E_r on poloidal gyro-radius measured is explained by radial diffusion of poloidal rotation velocity due to anomalous perpendicular viscosity. (author).

2704 (NIFS–216) **Analysis of current diffusive ballooning mode.** Yagi, M. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Azumi, M.; Itoh, K.; Itoh, S.; Fukuyama, A. National Inst. for Fusion Science, Nagoya (Japan). Apr 1993. 53p. Order Number DE94718992. Source: OSTI; NTIS; INIS.

The current diffusive ballooning mode is analysed in the tokamak plasma. This mode is destabilized by the current diffusivity (i.e., the electron viscosity) and stabilized by the thermal conductivity and ion viscosity. By use of the ballooning transformation, the eigenmode equation is solved. Analytic solution is obtained by the strong ballooning limit. Numerical calculation is also performed to confirm the analytic theory. The growth rate of the mode and the mode structure are analysed. The stability boundary is derived in terms of the current diffusivity, thermal conductivity, ion viscosity and the pressure gradient for the given shear parameter. This result is applied to express the thermal conductivity in terms of the pressure gradient, magnetic configurational parameters (such as the safety factor, shear and aspect ratio) and the Prandtl numbers. (author).

2705 (NIFS–217) **Particle orbit analysis for LHD helical axis configurations.** Guasp, J.; Yamazaki, K.; Motojima, O. National Inst. for Fusion Science, Nagoya (Japan). Apr 1993. 47p. Order Number DE94718995. Source: OSTI; NTIS; INIS.

Fast ion orbits for helical magnetic axis configurations in LHD (Large Helical Device) are analyzed and compared with the standard circular axis case. Boundaries between passing and helically trapped particle regions show clear differences: in the non-planar axis case the helically trapped region spreads, near the magnetic axis, over a much wider band across the 90deg pitch angle value and shows a very marked asymmetry. The locally trapped particle region is also wider than in the standard case. The differences in the loss cone boundaries of the two cases are rather small, however, the effects of re-entering criteria are very important in both cases. On the contrary, effects of finite coil size are not significant. (author).

2706 (NIFS–220) **Applications of non-resonant RF forces for improvement of tokamak reactor performances, 1: Application of ponderomotive force.** Watari, T.; Kumazawa, R.; Mutoh, T.; Seki, T.; Nishimura, K.; Shimpo, F. National Inst. for Fusion Science, Nagoya (Japan). May 1993. 41p. Order Number DE94718994. Source: OSTI; NTIS; INIS.

Applications of Radio Frequency to a tokamak divertor plasma for improvement of its reactor relevancy is studied and proposed. RF is applied to a divertor region of a tokamak by use of wave guide launchers on consideration of a reactor environment. Since the ponderomotive force is dependent on the charge to mass ratio of ions, various useful applications are considered. They covers some of the recent key issues in the development research toward nuclear fusion: the reduction of the heat load on the divertor plate, improvement of tritium inventory, impurity control, and helium ash removal. (author).

2707 (NIFS-MEMO–9) **Potential formation and transport in open field line systems.** Yatsu, Kiyoshi (Tsukuba Univ., Ibaraki (Japan). Plasma Research Center); Hatori, Tadatsugu (eds.). National Inst. for Fusion Science, Nagoya (Japan). Apr 1993. 118p. (In Japanese, English). Order Number DE94718910. Source: OSTI; NTIS; INIS.

Many studies have been reported on the potential formation in tandem mirrors and in many other systems. Plasma potentials are also interested in relation to the H-mode and divertor plasma in toroidal systems. The workshops 'Potential Formation and Transport in Open Field Line Systems' were organized three times as collaboration research at the National Institute for Fusion Science from 1990 to 1992. The workshops were aimed at the study of potential formation and related transport in various plasmas with emphasis on those in open magnetic field line systems. This memo is a report of research progress during the three years and new researches presented at the workshops. These workshops were supported by NIFS for the three years. (author).

2708 (ORNL/TM–12424) **Active probing of plasma edge turbulence and feedback studies on the Texas Experimental Tokamak (TEXT).** Uckan, T. (Oak Ridge National Lab., TN (United States)); Richards, B.; Bengtson, R.D. Oak Ridge National Lab., TN (United States). Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001017. Source: OSTI; NTIS; INIS; GPO Dep.

A novel experiment is under way on the Texas Experimental Tokamak (TEXT) to actively modify the turbulence at the plasma edge by launching waves using electrostatic probes in the shadow of the limiter. The experiments are carried out with a wave launching system consisting of two Langmuir probes, which are about 1.8 cm apart in the poloidal direction, with respect to the magnetic field. These probes are operated in the electron side of the (I,V) characteristic. The probe tips are fed separately by independent ac power supplies. Measurements indicate that the wave, launched

with a typical frequency image of 15–50 kHz from the edge of the machine top, is received by sensing probes located halfway around the torus. The detected signal strength depends on the frequency of the wave, the plasma current, and the phasing of the applied ac signal between the launching probes. Modifications to the spectra of the density and potential fluctuations are observed. These experiments have been extended to control of the edge plasma fluctuation level using feedback to explore its effects on confinement. When the launcher is driven by the floating potential of the fluctuating plasma at the location of the launching probes, then the fluctuations are suppressed or excited, depending on the phasing between the probe tips, both locally and at the downstream sensing probes. The fluctuation-induced particle flux also varies with the feedback phasing.

2709 (PPPL–2868) **Ion cyclotron transmission spectroscopy in the Tokamak Fusion Test Reactor.** Greene, G.J. Princeton Univ., NJ (United States). Plasma Physics Lab. Sep 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94000359. Source: OSTI; NTIS; INIS; GPO Dep.

The propagation of waves in the ion cyclotron range of frequencies has been investigated experimentally in the Tokamak Fusion Test Reactor. A small, broadband, radiofrequency (rf) magnetic probe located outside the plasma limiter, at a major radius near that of the plasma center, was excited with a low power, frequency swept source (1–200 MHz). Waves propagating to a distant location were detected with a second, identical probe. The rf transmission spectrum revealed a region of attenuation over a band of frequencies for which the minority fundamental resonance was located between the outer plasma edge and the major radius of the probe location. Distinct, non-overlapping attenuation bands were observed from hydrogen and helium-3 minority species; a distinct tritium band should be observed in future DT experiments. Rapid spectrum acquisition during a helium-3 gas puff experiment showed that the wave attenuation involved the plasma core and was not a surface effect. A model in which the received power varied exponentially with the minority density, averaged over the resonance region, fit the time evolution of the probe signal relatively well. Estimation of a 1-d tunneling parameter from the experimental observations is discussed. Minority concentrations of less than 0.5 % can be resolved with this measurement.

2710 (PPPL–2930) **A standard DT supershot simulation.** Budny, R.V. Princeton Univ., NJ (United States). Plasma Physics Lab. Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94000360. Source: OSTI; NTIS; INIS; GPO Dep.

A simulation of an anticipated TFTR DT supershot is described. The simulation is based on a reproducible, high performance, long duration DD supershot with a major radius of 2.45m. The TRANSP plasma analysis code is used to model fast ion (D,T, and alpha) parameters, including their distributions in energy and pitch angle. Values and fits are provided for comparing plasma modeling codes and for use in codes for analyzing MHD stability and collective alpha particle effects.

2711 (PPPL–2938) **Stability of the toroidicity-induced Alfven eigenmode in axisymmetric toroidal equilibria.** Fu, G.Y.; Cheng, C.Z.; Wong, K.L. Princeton Univ., NJ (United States). Plasma Physics Lab. Sep 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94000361. Source: OSTI; NTIS; INIS; GPO Dep.

The stability of toroidicity-induced Alfven eigenmodes (TAE) is investigated in general tokamak equilibria with finite aspect ratio and finite plasma beta. The finite orbit width of the hot particles and the collisional damping of the trapped electrons are included. For the trapped hot particles, the finite orbit width is found to be stabilizing. For the circulating hot particles, the finite orbit width effect is stabilizing for larger values of v_h/v_A (> 1) and destabilizing for smaller values of v_h/v_A (< 1), where v_h is the hot particle speed and v_A is the Alfven speed. The collisional damping of the trapped electrons is found to have a much weaker dependence on the collision frequency than the previous analytic results. The contribution of the curvature term to the trapped electron collisional damping is negligible compared to that of the parallel electric field term for typical parameters. The calculated critical hot particle beta values for the TAE instability are consistent with the experimental measurements.

2712 (PPPL–2940) **High-performance supershots in TFTR with lithium pellet injection.** Jassby, D.L. (and others); Mansfield, D.K.; Bell, M.G. Princeton Univ., NJ (United States). Plasma Physics Lab. Sep 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94001718. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing the amount of lithium pellet injection during the supershot conditioning procedures has enabled reliable enhancement of supershot confinement at higher plasma currents. Some shots have exceptionally good performance, with peak global parameters up to τE=205 ms, S_n=5.6 $\times$ 10^{16}n/s and Q_{DD}=2. 1 $\times$ 10^{-3}.

2713 (PPPL–2941) **Transport effects of low (m,n) MHD modes on TFTR supershots.** Chang, Z. (Wisconsin Univ., Madison, WI (United States)); Callen, J.D.; Fredrickson, E.D. Princeton Univ., NJ (United States). Plasma Physics Lab. Oct 1993. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94001717. Source: OSTI; NTIS; INIS; GPO Dep.

Supershots in TFTR often suffer a performance deterioration characterized by a gradual decrease of the D-D fusion neutron yield and plasma stored energy after several hundred milliseconds of auxiliary heating. The correlation between this performance deterioration and the development of low m (the poloidal mode number), n (the toroidal mode number) MHD modes is studied through shot-to-shot comparisons and statistical data analyses. A good correlation is observed between performance deterioration and the appearance of strong 3/2 and 4/3 macroscopic modes (magnetic islands) in small major radius plasmas (R = 2.45 m). The magnetic island structures are observed using Mirnov and ECE diagnostics. The measured T_e T_i and n_e, profiles show that development of the islands corresponds to a nearly constant decrement of these quantities over the core region $r < r_s$. where r_s is the mode rational surface, on a transport time scale ($t > \tau_E$). The observed energy deterioration scaling, $\delta W/W \sim w/a$, where w is the magnetic island width, agrees with both a local transport model and predictive numerical simulations. For larger major radius plasmas (R = 2.52, 2.60 m), a continuous increase of edge recycling rate during the neutral beam injection phase seems to have a larger effect on the performance deterioration than does the MHD.

2714 (PPPL–2943) **Modeling of MeV alpha particle energy transfer to lower hybrid waves.** Schivell, J.; Monticello, D.A.; Fisch, N.; Rax, J.M. Princeton Univ., NJ (United States). Plasma Physics Lab. Oct 1993. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94001935. Source: OSTI; NTIS; INIS; GPO Dep.

The interaction between a lower hybrid wave and a fusion alpha particle displaces the alpha particle simultaneously in space and energy. This results in coupled diffusion. Diffusion of alphas down the density gradient could lead to their transferring energy to the wave. This could, in turn, put energy into current drive. An initial analytic study was done by Fisch and Rax. Here the authors calculate numerical solutions for the alpha energy transfer and study a range of conditions that are favorable for wave amplification from alpha energy. They find that it is possible for fusion alpha particles to transfer a large fraction of their energy to the lower hybrid wave. The numerical calculation shows that the net energy transfer is not sensitive to the value of the diffusion coefficient over a wide range of practical values. An extension of this idea, the use of a lossy boundary to enhance the energy transfer, is investigated. This technique is shown to offer a large potential benefit.

2715 (PPPL-CFP–2959) **Electron density profile from visible bremsstrahlung array measurements on TFTR.** Park, H.K.; Adler, H. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-9310176–1: 6. international LAPP meeting, Boston, MA (United States), 25-28 Oct 1993). Order Number DE94000511. Source: OSTI; NTIS; INIS; GPO Dep.

A new asymmetric Abel inversion method developed for interferometry is applied to tangential visible bremsstrahlung (VB) array (16 channels) measurements on TFTR to evaluate electron density

and Z_{eff} profiles. the electron density profile deduced from VB array measurements is meaningful in tokamak plasmas where the Z_{eff} profile is flat or nearly flat. In addition, a preliminary result shows that the Z_{eff} profile is hollow in high power neutral-beam heated plasmas.

2716 (PPPL-CFP–2961) **Plasma studies for an upgraded TFTR experiment.** Pelovitz, M. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–1: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94000512. Source: OSTI; NTIS; INIS; GPO Dep.

During the summer of 1991 studies were requested and performed for the possibility of upgrading the TFTR plasma both In current capabilities and volume within the existing vacuum vessel. Additionally, many other constraints were Imposed upon the problem description 'and possible solutions were Investigated In turn. Incorporating the limitations necessitated by the existing TFTR facility. This paper formalizes the results obtained from this study. The plasma equilibrium code used to perform these studies Is a free boundary Tokamak equilibrium program developed by F. Holfmann In 1988 and is a relatively user friendly input code. Provisions are made for inputting fixed poloidal coil positions and currents and existing coil Interconnections which must be maintained. Other Input parameters include the plasma shape and current profile as well as pressure profiles and plasma currents. The code then itilerates until a solution, if obtainable, Is achieved within the constraint boundaries. Computer running time for any particular case Is usually less than a minute. Several different plasma profiles were Investigated and these are summarized In this paper. For plasma stability the q value at the plasma edge was never allowed to go below 3.0 In any of the different modes which were studied.

2717 (PPPL-CFP–2962) **Neutral gas transport modeling with DEGAS 2.** Stotler, D.; Karney, C. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931070–2: 4. international workshop on plasma edge theory in fusion devices, Varenna (Italy), 4-6 Oct 1993). Order Number DE94001495. Source: OSTI; NTIS; INIS; GPO Dep.

We are currently rewriting the neutral gas transport code, DEGAS with a view to not only making it faster, but also easing the process of including new physics. The goal is to make adding new species and reactions relatively simple so that the code can be rapidly adapted to new divertor physics regimes. DEGAS 2 will also be optimized for coupling to fluid plasma codes, incorporating many of the techniques utilized in B2-EIRENE. Finally, it is our intention that DEGAS 2, like DEGAS, be well-documented and easy to use. We ill present model calculations including ionization and charge exchange which will illustrate the way reactions are included into DEGAS 2 and will demonstrate operation of the code on a distributed network of workstations.

2718 (PPPL-CFP–2964) **Non-local transport in a tokamak plasma divertor with recycling.** Abou-Assaleh, Z. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Petravic, M.; Vesey, R.; Matte, J.P.; Johnston, T.W. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931070–3: 4. international workshop on plasma edge theory in fusion devices, Varenna (Italy), 4-6 Oct 1993). Order Number DE94001497. Source: OSTI; NTIS; INIS; GPO Dep.

The plasma transport, particle and energy fluxes, near the diverter plate with high recycling has been modeled by using an electron kinetic code (Fokker-Planck International) in conjunction with a two-fluid ambipolar code. We include the effects of ionization and excitation of the hydrogen atoms. The electron energy distribution calculated from the kinetic code shows a large deviation from Maxwellian especially near the plate. This deviation from Maxwellian is due to the non-local transport of the suprathermal electrons from the SOL, and due also to the absorption of the fast electrons by the target plate. The heat flux near the plate is shown to be nonlocal, in that it is not determined uniquely by the local plasma parameters. Therefore the classical transport coefficients in the fluid model must be modified by including a nonlocal effect to produce the kinetic results. The kinetic calculation is compared with those of the fluid code with different values of the electron heat flux limiter factor (f). To reduce the computer load, the initial condition we used corresponds to the equilibrium solution already found with the fluid code with f=0.2. The fluid and Fokker-Planck codes are relaxed until all transients associated with electron dynamics have disappeared. In section 2, we present the kinetic code. The fluid code is presented in section 3. The boundary conditions used in these simulations are given in section 4. Finally the results and conclusion of these simulations are presented in section 5.

2719 (PSC–29) **Oblique ion acoustic wave instabilities in a multi-ion plasma and ^{3}He-rich events.** Zhang, Tian-Xi; Toida, Mieko; Ohsawa, Yukiharu. Nagoya Univ. (Japan). Plasma Science Center. May 1993. 14p. Order Number DE94718912. Source: OSTI; NTIS; INIS.

Oblique ion acoustic waves in a current-carrying, magnetized plasma are investigated. For a multi-ion plasma whose dominant components are hydrogen and helium, it is found that for some plasma parameters oblique ion acoustic waves can have positive growth rates at frequencies $\omega \simeq \Omega_{3He}$ (^{3}He cyclotron frequency) and, at the same time, negative growth rates at $\omega \simeq \Omega_{4He}$. It is then suggested that these waves can play an essential role in the ^{3}He-rich solar flares. (author).

2720 (SAND–93-2182C) **Characterization of heat transport and radiation hydrodynamics in collisional laser plasmas using collective Thomson scattering.** Cameron, S.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ;W-7405-ENG-48. (CONF-9310195–1: 6. international symposium on laser-aided plasma diagnostics, Bar Harbor, ME (United States), 25-28 Oct 1993). Order Number DE94001502. Source: OSTI; NTIS; INIS; GPO Dep.

The author proposes using the collective Thomson scattering lineshape from ion acoustic waves to measure the spatial structure of local heat transport parameters and collisionality. Ion acoustic peak height asymmetry is used in conjunction with a recently developed model describing the effects of collisional and Landau damping contributions on the low-frequency electron density fluctuation spectrum to extract the relative electron drift. The local heat flux q_e (proportional to drift) and the electron thermal conductivity $\kappa_e - q_e/\nabla T_e$ would be inferred from experimentally determined temperature gradients ∇T_e. Damping of the entropy wave component at zero mode frequency is shown to be an estimate of the ion thermal conductivity κ_i, and its visibility is a direct measure of the ion-ion mean free path λ_{ii}.

2721 (UCB/ERL-M–92/145) **Electron temperature gradient driven instability in the tokamak boundary plasma.** Xu, X.Q.; Rosenbluth, M.N.; Diamond, P.H. California Univ., Berkeley, CA (United States). Electronics Research Lab. 15 Dec 1992. 24p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-90ER54079 ;FG03-88ER53275. Contract N00014-89-J-1097. Order Number DE94001307. Source: OSTI; NTIS; INIS; GPO Dep.

A general method is developed for calculating boundary plasma fluctuations across a magnetic separatrix in a tokamak with a divertor or a limiter. The slab model, which assumes a periodic plasma in the edge reaching the divertor or limiter plate in the scrape-off layer(SOL), should provide a good estimate, if the radial extent of the fluctuation quantities across the separatrix to the edge is small compared to that given by finite particle banana orbit. The Laplace transform is used for solving the initial value problem. The electron temperature gradient(ETG) driven instability is found to grow like $t^{-1/2}e^{\gamma_{ETG}t}$.

2722 (UCB/ERL-M–92/147) **Fluid simulations of ∇T_e-driven turbulence and transport in boundary plasmas.** Xu, X.Q. California Univ., Berkeley, CA (United States). Electronics Research Lab. 15 Dec 1992. 26p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-90ER54079. Contract N00014-85-K0809. Order Number DE94001304. Source: OSTI; NTIS; INIS; GPO Dep.

It is clear that the edge plasma plays a crucial role in global tokamak confinement. This paper is a report on simulations of a new drift wave type instability driven by the electron temperature gradient in tokamak scrapeoff-layers (SOL). A 2d fluid code has been developed in order to explore the anomalous transport in the boundary plasmas. The simulation consists of a set of fluid equations for the vorticity $\nabla_\perp{}^2\phi$, the electron density n_e and the temperature T_e in a shearless plasma slab confined by a uniform, straight magnetic field B_z with two divertor (or limiter) plates intercepting the magnetic field. The model has two regions separated by a magnetic separatrix: in the edge region inside the separatrix, the model is periodic along the magnetic field while in the SOL region outside the separatrix, the magnetic field is taken to be of finite length with model boundary conditions at diverter plates. The simulation results show that the observed linear instability agrees well with theory, and that a saturated state of turbulence is reached. In saturated turbulence, clear evidence of the expected long-wavelength mode penetration into the edge is seen, an inverse cascade of wave energy is observed. The simulation results also show that amplitudes of potential and the electron temperature fluctuations are somewhat above and the heat flux are somewhat below those of the simplest mixing-length estimates, and furthermore the large-scale radial structures of fluctuation quantities indicate that the cross-field transport is not diffusive. After saturation, the electron density and temperature profiles are flattened. A self-consistent simulation to determine the microturbulent SOL electron temperature profile has been done, the results of which reasonably agree with the experimental measurements.

2723 (UCB/ERL-M–92/148) **Theory and simulation of plasma sheath waves.** Xu, X.Q.; DiPeso, G.; Vahedi, V.; Birdsall, C.K. California Univ., Berkeley, CA (United States). Electronics Research Lab. 15 Dec 1992. 13p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-90ER54079. Contract N00014-85-K0809. Order Number DE94001305. Source: OSTI; NTIS; INIS; GPO Dep.

Sheath waves have been investigated analytically and with particle simulation for an unmagnetized two dimensional plasma slab with periodic boundary conditions in y and conducting walls at x = 0, L_x. Analytically treating the sheath as a vacuum layer, the sheath wave bears a resemblance to plasma vacuum surface waves. The simulations are in agreement with the theory for both bulk Bohm Grow waves and edge sheath waves, with some unanswered questions. Some waves that were expected did not show up, at least, where we thought they should be. Hence, improvements were made in the initialization (a better quiet start), in the diagnostics (especially the spectra in frequency), and in the excitation (ability to pulse). It has become clear that this problem, seeking both sheath (or surface) and body waves in a bounded system, needs far more attention, in analysis (non-uniform density included) and in simulation, especially in diagnostics. Hence, this report is to be treated as a start on the problem. The problem is not dropped, as the understanding of such waves (in 2d and 3d) is very important, for both basic sheath understanding and for applications, such as plasma control via excitation of sheath or pre-sheath waves.

2724 (UCRL-ID–114696) **A spheromak ignition experiment reusing Mirror Fusion Test Facility (MFTF) equipment.** Fowler, T.K. Lawrence Livermore National Lab., CA (United States). 28 Sep 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001856. Source: OSTI; NTIS; INIS; GPO Dep.

Based on available experimental results and theory, a scenario is presented to achieve ohmic ignition in a spheromak by slow (~ 10 sec.) helicity injection using power from the Mirror Fusion Test Facility (MFTF) substation. Some of the other parts needed (vacuum vessel, coils, power supplies, pumps, shielded building space) might also be obtained from MFTF or other salvage, as well as some components needed for intermediate experiments for additional verification of the concept (especially confinement scaling). The proposed ignition experiment would serve as proof-of-principle for the spheromak DT fusion reactor design published by Hagenson and Krakowski, with a nuclear island cost about ten times less than a tokamak of comparable power. Designs at even higher power density and lower cost might be possible using Christofilos' concept of a liquid lithium blanket. Since all structures would be protected from neutrons by the lithium blanket and the tritium inventory can be reduced by continuous removal from the liquid blanket, environmental and safety characteristics appear to be favorable.

2725 (UCRL-JC–114695) **Benchmarking UEDGE with DIII-D data.** Porter, G.D. (Lawrence Livermore National Lab., CA (United States)); Fenstermacher, M.; Rensink, M.E.; Rognlien, T.D.; Groebner, R.; Leonard, A.; Nguyen, Q. Lawrence Livermore National Lab., CA (United States); General Atomics, San Diego, CA (United States). Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ;W-7405-ENG-48. (CONF-931070–4: 4. international workshop on plasma edge theory in fusion devices, Varenna (Italy), 4-6 Oct 1993). Order Number DE94001604. Source: OSTI; NTIS; INIS; GPO Dep.

Comparisons between a 2-D fluid simulation of the scrape-off-layer (SOL) plasma of a diverted tokamak and experimental data from the DIII-D are shown. It is concluded that a simple diffusive model for perpendicular transport is consistent with the data. Discrepancies in the simulation suggest that impurity radiation may be playing a significant role in the experiment, and that further work is required to understand hydrogen recycling at the divertor.

2726 (UCRL-JC–114803) **Imaging XUV spectroscopy of a Z-pinch plasma in the former Soviet Union.** Bruns, H.C.; Springer, P.T.; Emig, J.A.; Lanier, N.E.; Hernandez, J.A. Lawrence Livermore National Lab., CA (United States). 11 Aug 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–38: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93040849. Source: OSTI; NTIS; GPO Dep.

In 1991 a group of scientists from the Angara 5 pulsed power facility at the Kurchatov Institute in Troitsk, Russia had determined the thermal emission from an implosion of xenon gas onto an annular, molybdenum doped foam liner to be 30 TW/cm^2. This represents an extremely efficient conversion of energy into a high fluence radiation field. In order to verify this claim and better understand the process of producing radiation by means of a Z-pinch plasma device, a series of experiments were proposed through a collaboration from Sandia National Laboratory, Albuquerque, Los Alamos National Laboratory, and Lawrence Livermore National Laboratory. Due to previous experience with x-ray spectroscopic measurements in the XUV region, the team from Lawrence Livermore Lab took on the task of designing, constructing, and fielding the necessary diagnostic equipment to spatially and temporally resolve plasma temperatures throughout the implosion of the high Z foam target.

2727 (UW-CPTC–93-5) **Nonlinear ion-mixing-mode particle transport in the dissipative trapped electron regime.** Ware, A.S. (Wisconsin Univ., Madison, WI (United States). Dept. of Physics); Terry, P.W. Wisconsin Univ., Madison, WI (United States). Center for Plasma Theory and Computation. Sep 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER53218. Order Number DE94000989. Source: OSTI; NTIS; INIS; GPO Dep.

The nonlinear particle transport arising from the convection of nonadiabatic electron density by ion temperature gradient driven turbulence is examined for trapped electron collisionality regimes. The renormalized dissipative nonadiabatic trapped electron phase space density response is derived and used to calculate the nonlinear particle flux along with an ansatz for the turbulently broadened frequency spectrum. In the lower temperature end of this regime, trapped electrons are collisional and all components of the quasilinear particle flux are outward (i.e., in the direction of the gradients). Nonlinear effects can alter the phase between the nonadiabatic trapped electron phase space density and the electrostatic potential, producing inward components in the particle flux. Specifically, both turbulent shifting of the peak of the frequency spectrum and nonlinear source terms in the trapped electron response can give rise to inward components. However, in the dissipative regime these terms are small and the trapped electron response remains dominantly laminar. When the trapped electrons are collisionless,

there is a temperature threshold above which the electron temperature gradient driven component of the quasilinear particle flux changes sign and becomes inward. For finite amplitude turbulence, however, turbulent broadening of both the electron collisional resonance and the frequency spectrum removes tills threshold., and the temperature gradient driven component remains outward.

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Refer also to citation(s) 987, 990, 2622, 2623, 2638, 2639, 2640, 2692, 2712, 2716, 2718, 2720

2728 (ANL/EP/CP–79740) **Analysis of beam on target interaction in a neutron-source test facility.** Hassanein, A.; Smith, D. Argonne National Lab., IL (United States). Aug 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930928–3: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE93040228. Source: OSTI; NTIS; INIS; GPO Dep.

The need is urgent for a high-flux, high-energy neutron test facility to evaluate the performance of fusion reactor materials. An accelerator-based deuterium-lithium source is generally considered the most reasonable approach to a high-flux neutron source in the near future. The idea is to bombard a high-energy (20–40 MeV) deuteron beam into a lithium jet target to produce high-energy neutrons in order to simulate a fusion reactor environment via the Li (d,n) nuclear stripping reaction. Deposition of the high-energy deuteron beam and the subsequent response of the lithium jet are modeled and evaluated in detail. To assess the feasibility of this concept, the analysis is done parametrically for various deuteron beam energies, beam currents, and jet velocities. A main requirement for a successful operation is to keep the free jet surface at a minimum temperature to reduce surface evaporation of lithium into the vacuum system. The effects of neutron-generated heating and irradiation on the jet-supporting back plate are also evaluated. The back plate must maintain a reasonable lifetime during system operation.

2729 (ANL/EP/CP–79741) **Beryllium and graphite performance in ITER during a disruption.** Hassanein, A. (Argonne National Lab., IL (United States)); Ehst, D.A.; Gahl, J. Argonne National Lab., IL (United States). Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001340. Source: OSTI; NTIS; INIS; GPO Dep.

Plasma disruptions are considered one of the most limiting factors for successful operation of magnetic fusion reactors. During a disruption, a sharp, rapid release of energy strikes components such as the divertor or limiter plates. Severe surface erosion and melting of these components may then occur. The amount of material eroded from both ablation and melting is important to the reactor design and component lifetime. The anticipated performance of both beryllium and graphite as plasma-facing materials during such abnormal events is analyzed and compared. Recent experimental data obtained with both plasma guns and electron beams are carefully evaluated and compared to results of analytical modeling, including vapor shielding effect. Initial results from plasma gun experiments indicate that the Be erosion rate is about five times larger than that for a graphite material under the same disruption conditions. Key differences between simulation experiments and reactor disruption on the net erosion rate, and consequently on the lifetime of the divertor plate, are discussed in detail. The advantages and disadvantages of Be over graphite as a divertor plasma-facing material are discussed.

2730 (ANL/EP/CP–79902) **Computational model of surface ablation from tokamak disruptions.** Ehst, D.; Hassanein, A. Argonne National Lab., IL (United States). Oct 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931018–36: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002204. Source: OSTI; NTIS; INIS; GPO Dep.

Energy transfer to material surfaces is dominated by photon radiation through low temperature plasma vapors if tokamak disruptions are due to low kinetic energy particles (< 100 eV). Simple models of radiation transport are derived and incorporated into a fast-running computer routine to model this process. The results of simulations are in fair agreement with plasma gun erosion tests on several metal targets.

2731 (ANL/EP/CP–79939) **Engineering design of ARIES-III.** Sze, D.K. (Argonne National Lab., IL (United States)); Wong, C.; Cheng, E. Argonne National Lab., IL (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9307125–2: 2. ^{3}He and fusion power symposium, Madison, WI (United States), 18-22 Jul 1993). Order Number DE93019559. Source: OSTI; NTIS; INIS; GPO Dep.

An efficient organic cooled low activation ferritic steel first wall and shield has been designed for the D-^{3}He power reactor ARIES-III. The design allows removal of the large surface heat load without exceeding temperature and stress design limits. The structure is expected to last for the whole reactor life. The major concerns regarding using the organic coolant in fusion reactors have been greatly alleviated.

2732 (ANL/EP/CP–80924) **Review of past experiments at the FELIX facility and future plans for ITER applications.** Hua, T.Q.; Turner, L.R. Argonne National Lab., IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309261–1: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Ibaraki (Japan), 15-17 Sep 1993). Order Number DE94001426. Source: OSTI; NTIS; INIS; GPO Dep.

FELIX is an experimental test facility at Argonne National Laboratory (ANL) for the study of electromagnetic effects in first wall, blanket, shield systems of fusion reactors. From 1983 to 1986 five major test series, including static and dynamic tests, were conducted and are reviewed in this paper. The dynamic tests demonstrated an important coupling effect between eddy currents and motion in a conducting structure. Recently the US has proposed to the ITER Joint Central Team to use FELIX for testing mock-up components to study electromagnetic effects encountered during plasma disruptions and other off-normal events. The near and long term plans for ITER applications are discussed.

2733 (ANL/ET/CP–80889) **Effects of neutron irradiation and hydrogen on ductile-brittle transition temperatures of V-Cr-Ti alloys.** Loomis, B.A.; Chung, H.M.; Nowicki, L.J.; Smith, D.L. Argonne National Lab., IL (United States). Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930928–8: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE94001466. Source: OSTI; NTIS; INIS; GPO Dep.

The effects of neutron irradiation and hydrogen on the ductile-brittle transition temperatures (DBTTs) of unalloyed vanadium and V-Cr-Ti alloys were determined from Charpy-impact tests on 1/3 ASTM standard size specimens and from impact tests on 3-mm diameter discs. The tests were conducted on specimens containing <30 appm hydrogen and 600-1200 appm hydrogen and on specimens after neutron irradiation to 28-46 dpa at 420, 520, and 600C. The DBTTs were minimum (< −220°C) for V-(105)Ti alloys under for V-4-Cr-4Ti alloy with <30 appm hydrogen. The effect of 600-1200 appm hydrogen in the specimens was to raise the DBTTs by 100–150°C. The DBTTs were minimum (< −220°C) for V-(1-5)Ti alloys and V-4-Cr-4Ti alloys after neutron irradiation.

2734 (CNIC–00660) **Experiment and research on materials irradiated by plasma radiation.** Hong Wenyu (Southwest Inst. of Physics, Leshan, SC (China)); Yao Lianghua; Tang Sujun; Chang Shufen; Li Guodong. China Nuclear Information Centre, Beijing, BJ (China). Aug 1992. 11p. (In Chinese). (SIP–0052.). Order Number DE94605011. Source: OSTI; NTIS (US Sales Only); INIS.

The TiC and SiC coating on the graphite substrate and wall carbonization were studied by plasma radiation in HL-1 tokamak. Samples were analysed with AES (auger electron spectroscopy), SEM (scanning electron microscopy), XPS (X-ray photoelectron spectroscopy) and XDS (X-ray diffraction spectroscopy). The results show that the TiC and SiC materials coated on limiter and wall and wall carbonization can reduce the metal and oxygen impurities and improve the plasma merit.

2735 (CONF-930511–493) **CARM and harmonic gyro-amplifier experiments at 17 GHz.** Menninger, W.L. (Massachusetts Inst. of Technology, Cambridge, MA (United States). Plasma Fusion Center); Danly, B.G.; Alberti, S.; Chen, C.; Rullier, J.L.; Temkin, R.J.; Giguet, E. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. [1993]. 4p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); Lawrence Livermore National Lab., CA (United States); Swiss National Science Foundation, Bern (Switzerland); CEA, 75 - Paris (France). DOE Contract FG02-89ER14052. Grant 8220-30665. From International particle accelerator conference; Washington, DC (United States); 17-20 May 1993. Order Number DE94001849. Source: OSTI; NTIS; INIS; GPO Dep.

Cyclotron resonance maser amplifiers are possible sources for applications such as electron cyclotron resonance heating of fusion plasmas and driving high-gradient rf linear accelerators. For accelerator drivers, amplifiers or phase locked-oscillators are required. A 17 GHz cyclotron autoresonance maser (CARM) amplifier experiment and a 17 GHz third harmonic gyro-amplifier experiment are presently underway at the MIT Plasma Fusion Center. Using the SRL/MIT SNOMAD II introduction accelerator to provide a 380 kV, 180 A, 30 ns flat top electron beam, the gyro-amplifier experiment has produced 5 MW of rf power with over 50 dB of gain at 17 GHz. The gyro-amplifier operates in the TE_{31} mode using a third harmonic interaction. Because of its high power output, the gyro-amplifier will be used as the rf source for a photocathode rf electron gun experiment also taking place at MIT. Preliminary gyro-amplifier results are presented, including measurement of rf power, gain versus interaction length, and the far-field pattern. A CARM experiment designed to operate in the TE_{11} mode is also discussed.

2736 (CONF-9305210–2) **Assessment of stellarators as reactors.** Lyon, J.F. Oak Ridge National Lab., TN (United States). 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. International Atomic Energy Agency (IAEA) workshop on stellarators; Garching (Germany); 10-14 May 1993. Order Number DE93017775. Source: OSTI; NTIS; INIS; GPO Dep.

Stellarators have significant operational advantages over tokamaks as ignited steady-state reactors: no dangerous disruptions, no need for continuous current drive and power recirculated to the plasma, less severe constraints on the plasma parameters and profiles, and access from the inboard side for easier maintenance. The US is starting a multi-year multi-institutional stellarator reactor study whose purpose is to "identify and assess the feasibility of critical issues and their consequences for development of the stellarator concept as a steady-state fusion reactor." The activities during the first year are focusing on physics optimization and selection of one or more stellarator coil configurations for more detailed engineering design evaluation. The physics team is focusing on torsatron modularization, modular stellarators with lower aspect ratio, the divertor geometry, development of transport models, and overall system studies. The engineering team is studying design issues relating to minimizing the inboard thickness of the blanket and shields, the feasibility of the superconducting magnets, and maintenance schemes.

2737 (DOE/ER/14052–3) **High frequency CARM driver for rf linacs: Final report, September 15, 1989–March 15, 1993.** Danly, B.G. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. 23 Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER14052. Order Number DE94001790. Source: OSTI; NTIS; INIS; GPO Dep.

This CARM program has successfully demonstrated the first ever long-pulse CARM oscillator operation; these results demonstrate the potential of CARMs as an alternative source of millimeter waves to the gyrotron for ECRH plasma heating. The result of 1.8 MW at 27.8 GHz and 0.5 μs pulse width in the TE_{11} mode represent a clear demonstration of the capabilities of the CARM oscillator for the production of high powers with large frequency upshift. It is hoped that this successful proof-of-principle demonstration.will lead to further development of the CARM as an ECRH source by the DOE Office of Fusion Energy, Development and Technology Division. This success is a direct outcome of this support of the Advanced Energy Projects Office of DOE in the form of this program. The CARM amplifier component of the program, although unsuccessful at obtaining CARM amplifier operation at 17 GHz, has succeeded by furthering the understanding of the limitations and difficulties that lie ahead for continued CARM amplifier development. The amplifier component of the program has successfully demonstrated a high power second and third harmonic gyro-TWT amplifier. Up to 5 MW of power at 17.1 GHz and >50dB gain have been obtained. These results should be viewed as an important contribution of this program to the development of viable microwave sources for powering the next linear collider. Indeed, the present gyro-amplifier, which resulted from this program, is presently being used in ongoing high-gradient accelerator research at MIT under a DOE High Energy Physics grant. As a result of both the oscillator and amplifier advances made during this program, the CARM and harmonic gyro-TWT have reached a significantly more mature level; their future role in specific applications of benefit to DOEs OFE and HEP offices may now be pursued.

2738 (DOE/ER/53264–4) **1993 annual report for the Phaedrus-T RF current drive experiments.** Hershkowitz, N. Wisconsin Univ., Madison, WI (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER53264. Order Number DE94001369. Source: OSTI; NTIS; INIS; GPO Dep.

After a series of antenna modifications and a program of optimizing our Boronization procedures, we have succeeded in coupling 300 kill of rf power to the plasma. Thomson Scattering shows a 20–60% increase in core T_e, and constitutes experimental evidence that the waves are interacting with the electron population. Beam Emission Spectroscopy (BES) data show that the power is deposited in the core and at the edge as predicted by theoretical modeling. Ninety degree phasing of the antenna caused loop voltage drops of 15–25%, which can be interpreted as an increase 5 kA of toroidal plasma current for co-injection phasing versus counter injection phasing. Biased H-modes have been created with a biased electrode. These plasmas have a steeper edge density gradient and reduced edge fluctuations than our normal limiter plasmas and a D_{alpha} emission drop at the limiter. Radial profiles of soft x-ray line emission have been measured by the Johns Hopkins group and significantly aided in our understanding of impurity generation with rf and in the biased H-mode. Initial reflectometry data shows the presence of rf density fluctuations in the plasma. Different boronization techniques have been tried leading to a higher boron content in the deposited layer and reduced wall recycling. In this report, we outline the series of experiments that we have performed in the last year that led us to our present encouraging results.

2739 (DOE/ET/53088–626) **A two-dimensional kinetic model of the scrape-off layer.** Catto, P.J. (Texas Univ., Austin, TX (United States). Inst. for Fusion Studies); Hazeltine, R.D. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088 ;FG05-88ER53267 ;FG02-91ER54109. (IFSR–626). Order Number DE94001235. Source: OSTI; NTIS; INIS; GPO Dep.

A two-dimensional (radius and poloidal angle), analytically tractable kinetic model of the ion (or energetic electron) behavior in the scrape-off layer of a limiter or divertor plasma in a tokamak is presented. The model determines the boundary conditions on the core ion density and ion temperature gradients, the power load on the limiter or divertor plates, the energy carried per particle to the walls, and the effective flux limit. The self-consistent electrostatic potential in the quasi-neutral scrape-off layer is determined by using the ion kinetic model of the layer along with a Maxwell-Boltzmann electron response that occurs because most electrons are reflected by the Debye sheaths (assumed to be infinitely thin) at the limiter or divertor plates.

2740 (DOE/OR/00033–T533) **Coupled two-dimensional edge plasma and neutral gas modeling of tokamak scrape-off-layers.** Maingi, R. (North Carolina State Univ., Raleigh, NC (United States)). Oak Ridge Inst. for Science and Education, TN (United States); North Carolina State Univ., Raleigh, NC (United States).

Aug 1992. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000827. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to North Carolina State University, Raleigh, NC.

The objective of this study is to devise a detailed description of the tokamak scrape-off-layer (SOL), which includes the best available models of both the plasma and neutral species and the strong coupling between the two in many SOL regimes. A good estimate of both particle flux and heat flux profiles at the limiter/divertor target plates is desired. Peak heat flux is one of the limiting factors in determining the survival probability of plasma-facing-components at high power levels. Plate particle flux affects the neutral flux to the pump, which determines the particle exhaust rate. A technique which couples a two-dimensional (2-D) plasma and a 2-D neutral transport code has been developed (coupled code technique), but this procedure requires large amounts of computer time. Relevant physics has been added to an existing two-neutral-species model which takes the SOL plasma/neutral coupling into account in a simple manner (molecular physics model), and this model is compared with the coupled code technique mentioned above. The molecular physics model is benchmarked against experimental data from a divertor tokamak (DIII-D), and a similar model (single-species model) is benchmarked against data from a pump-limiter tokamak (Tore Supra). The models are then used to examine two key issues: free-streaming-limits (ion energy conduction and momentum flux) and the effects of the non-orthogonal geometry of magnetic flux surfaces and target plates on edge plasma parameter profiles.

2741 (GA-A–21349) **The development of an in-vessel cryopump system for the DIII-D tokamak.** Schaubel, K.M. (General Atomics, San Diego, CA (United States)); Baxi, C.B.; Campbell, G.L.; Laughon, G.J.; Mahdavi, M.A.; Makariou, C.C.; Smith, J.P.; Schaffer, M.J.; Menon, M.M. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States). Jul 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ;AC05-84OR21400. (CONF-930703–25: International cryogenic engineering conference and international cryogenic materials conference, Albuquerque, NM (United States), 12-16 Jul 1993). Order Number DE93040371. Source: OSTI; NTIS; INIS; GPO Dep.

The design, testing and initial operation of the DIII-D advanced divertor cryocondensation pumping system is presented. The pump resides inside the tokamak plasma containment vessel where it provides particle exhaust pumping, and it is subjected to Joule heating and hot particle heat loads during each 10 second discharge. In addition, the pump must withstand plasma disruption induced electromagnetic forces and 400°C bake-out temperatures. Cooling is accomplished by forced flow liquid helium with the two-phase helium exhaust passing through a reliquefier for thermal efficiency. A prototype pump was constructed to study surface temperature rise as a function of flow geometry, applied heat load, helium mass flow rate, and pump outlet conditions. Prototype testing led to the development of a special geometry which was demonstrated to enhance two-phase flow stability and overall heat transfer. During initial operation, deuterium pumping speeds of 32,000 L/s at 2 mTorr pressure were achieved with a helium flow rate of 5 g/s. This speed was maintained during 300 W, 8 s long test beat pulses which meets operational goals.

2742 (GA-A–21381) **Feedback controlled hybrid fast ferrite tuners.** Remsen, D.B. (General Atomics, San Diego, CA (United States)); Phelps, D.A.; deGrassie, J.S.; Cary, W.P.; Pinsker, R.I.; Moeller, C.P.; Arnold, W.; Martin, S.; Pivit, E. General Atomics, San Diego, CA (United States). Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER52153. (CONF-931018–13: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001110. Source: OSTI; NTIS; INIS; GPO Dep.

A low power ANT-Bosch fast ferrite tuner (FFT) was successfully tested into (1) the lumped circuit equivalent of an antenna strap with dynamic plasma loading, and (2) a plasma loaded antenna strap in DIII-D. When the FFT accessible mismatch range was phase-shifted to encompass the plasma-induced variation in reflection coefficient, the 50 Ω source was matched (to within the desired 1.4 : 1 voltage standing wave ratio). The time required to achieve this match (i.e., the response time) was typically a few hundred milliseconds, mostly due to a relatively slow network analyzer-computer system. The response time for the active components of the FFT was 10 to 20 msec, or much faster than the present state-of-the-art for dynamic stub tuners. Future FFT tests are planned, that will utilize the DIII-D computer (capable of submillisecond feedback control), as well as several upgrades to the active control circuit, to produce a FFT feedback control system with a response time approaching 1 msec.

2743 (GA-A–21396) **Installation and initial operation of the DIII-D advanced divertor cryocondensation pump.** Smith, J.P. (General Atomics, San Diego, CA (United States)); Schaubel, K.M.; Baxi, C.B.; Campbell, G.L.; Hyatt, A.W.; Laughon, G.J.; Mahdavi, M.A.; Reis, E.E.; Schaffer, M.J.; Sevier, D.L.; Stambaugh, R.D.; Menon, M.M. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ;AC05-84OR21400. (CONF-931018–20: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001106. Source: OSTI; NTIS; INIS; GPO Dep.

Phase two of a divertor cryocondensation pump, the Advanced Divertor Program, is now installed in the DIII-D tokamak at General Atomics and complements the phase one biasable ring electrode. The installation consists of a 10 m long cryocondensation pump located in the divertor baffle chamber to study plasma density control by pumping of the divertor. The design is a toroidally electrically continuous liquid helium-cooled panel with 1 m^2 of pumping surface. The helium panel is single point grounded to the nitrogen shield to minimize eddy currents. The nitrogen shield is toroidally continuous and grounded to the vacuum vessel in 24 locations to prevent voltage potentials from building up between the pump and vacuum vessel wall. A radiation/particle shield surrounds the nitrogen-cooled surface to minimize the heat load and prevent water molecules condensed on the nitrogen surface from being released by impact of energetic particles. Large currents (>5000 A) are driven in the helium and nitrogen panels during ohmic coil ramp up and during disruptions. The pump is designed to accommodate both the thermal and mechanical loads due to these currents. A feedthrough for the cryogens allows for both radial and vertical motion of the pump with respect to the vacuum vessel. Thermal performance measured on a prototype verified the analytical model and thermal design of the pump. Characterization tests of the installed pump show the pumping speed in deuterium is 42,000 ℓ/sec for a pressure of 5 mTorr. Induction heating of the pump (at 300 W) resulted in no degradation of pumping speed. Plasma operations with the cryopump show a 60% lower density in H-mode.

2744 (GA-A–21403) **Use of open systems for control, analysis, and data acquisition of the DIII-D tokamak.** Henline, P.A. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–9: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001101. Source: OSTI; NTIS; INIS; GPO Dep.

For the past several years, it has been evident that the very old MODCOMP 16-bit computers being used at DIII-D for control and data acquisition were no longer adequate to perform the services needed. In early 1992, the computer systems group began to look seriously into alternate systems to replace these aged MODCOMP systems. The decision was made to investigate 'OPEN' system computers and also to maintain the compatibility with the large usage of CAMAC equipment as the real-time hardware interface. Information about the needs for real-time capabilities and 'OPEN' systems ability to meet these needs is discussed. The needs include hardware requirements, operating system software which has known response rates, interconnectability and access of data from other workstations and computers. Some of the parameters and pitfalls of open systems are discussed as well as the advantages of OPEN systems for use in a real-time environment. The success at arriving at an OPEN systems solution is examined.

2745 (GA-A–21404) **Access to DIII-D data located in multiple files and multiple locations.** McHarg, B.B. Jr. General

Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–18: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001104. Source: OSTI; NTIS; INIS; GPO Dep.

The General Atomics DIII-D tokamak fusion experiment is now collecting over 80 MB of data per discharge once every 10 min, and that quantity is expected to double within the next year. The size of the data files, even in compressed format, is becoming increasingly difficult to handle. Data is also being acquired now on a variety of UNIX systems as well as MicroVAX and MODCOMP computer systems. The existing computers collect all the data into a single shot file, and this data collection is taking an ever increasing amount of time as the total quantity of data increases. Data is not available to experimenters until it has been collected into the shot file, which is in conflict with the substantial need for data examination on a timely basis between shots. The experimenters are also spread over many different types of computer systems (possibly located at other sites). To improve data availability and handling, software has been developed to allow individual computer systems to create their own shot files locally. The data interface routine PTDATA that is used to access DIII-D data has been modified so that a user's code on any computer can access data from any computer where that data might be located. This data access is transparent to the user. Breaking up the shot file into separate files in multiple locations also impacts software used for data archiving, data management, and data restoration.

2746 (GA-A–21414) **DIII-D cryogenics control system status.** Campbell, G.L.; Harris, J.J.; Schaubel, K.M. General Atomics, San Diego, CA (United States). Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–8: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001100. Source: OSTI; NTIS; INIS; GPO Dep.

The DIII-D cryogenics system provides liquid helium for various auxiliary systems at the DIII-D tokamak facility. The system described here executes control and supervision of the cryogenics plant and associated load systems which include four neutral beam injectors, superconducting magnets, and an in-vessel tokamak cryocondensation pump. The recent addition of this divertor cryopump represented a major increase in the scope of the control system and greater need for reliable and automatic operation. The pump must be precooled, cooled and regenerated in a relatively short period of time under automatic control. Since the pump is located in the tokamak primary vacuum, coordination with the machine vacuum control system and consideration for the requirements of physics operations and vessel wall conditioning are required. A programmable logic controller is the central element in the cryogenics control system and exercises direct or supervisory control over the liquefier, gas management and loads. In the time since the control system was built during 1989, additions and improvements have been made to simplify operation and support upgrades. Cryogenics system capacity has been upgraded by the purchase of a new 150 ℓ/hr helium liquefier, a second 400 hp helium compressor and additional gas storage. The new liquefier incorporates a controller of its own which exchanges information with the cryogenics control system. This independent controller relieved the main system of liquefier process control tasks but necessitates much finer control of the system high and low pressures. The control system upgrades and automation are discussed with emphasis on the divertor cryocondensation pump control.

2747 (GA-A–21416) **CAMAC throughput of a new RISC-based data acquisition computer at the DIII-D tokamak.** VanderLaan, J.F.; Cummings, J.W. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–11: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001113. Source: OSTI; NTIS; INIS; GPO Dep.

The amount of experimental data acquired per plasma discharge at DIII-D has continued to grow. The largest shot size in May 1991 was 49 Mbyte; in May 1992, 66 Mbyte; and in April 1993, 80 Mbyte. The increasing load has prompted the installation of a new Motorola 88100-based MODCOMP computer to supplement the existing core of three older MODCOMP data acquisition CPUs. New Kinetic Systems CAMAC serial highway driver hardware runs on the 88100 VME bus. The new operating system is MODCOMP REAL/IX version of AT&T System V UNIX with real-time extensions and networking capabilities; future plans call for installation of additional computers of this type for tokamak and neutral beam control functions. Experiences with the CAMAC hardware and software will be chronicled, including observation of data throughput. The Enhanced Serial Highway crate controller is advertised as twice as fast as the previous crate controller, and computer I/O speeds are expected to also increase data rates.

2748 (GA-A–21417) **Upgrade of the DIII-D vacuum vessel protection system.** Hollerbach, M.A.; Lee, R.L.; Smith, J.P.; Taylor, P.L. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–12: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001213. Source: OSTI; NTIS; INIS; GPO Dep.

An upgrade of the General Atomics DIII-D tokamak armor protection system has been completed. The upgrade consisted of armoring the outer wall and the divertor gas baffle with monolithic graphite tiles and cleaning the existing floor, ceiling, and inner wall tiles to remove any deposited impurity layer from the tile surfaces. The new tiles replace the graphite tiles used as local armor for neutral beam shine through, three graphite poloidal back-up limiter bands, and miscellaneous Inconel protection tiles. The total number of tiles increased from 1636 to 3200 and corresponding vessel coverage from 40% to 90%. A new, graphite armored, toroidally continuous, gas baffle between the outer wall and the biased divertor ring was installed in order to accommodate the cryocondensation pump that was installed in parallel with the outer wall tiles. To eliminate a source of copper in the plasma, GRAFOIL gaskets replaced the copper felt metal gaskets previously used as a compliant heat transfer interface between the inertially cooled tiles and the vessel wall. GRAFOIL, an exfoliated, flexible graphite material from Union Carbide, Inc., was used between each tile and the vessel wall and also between each tile and its hold-down hardware. Testing was performed to determine the mechanical compliance, thermal conductance, and vacuum characteristics of the GRAFOIL material. To further decrease the quantity of high Z materials exposed to the plasma, the 1636 existing graphite tiles were identified, removed, and grit blasted to eliminate a thin layer of deposited metals which included nickel, chromium, and molybdenum. Prior to any processing, a selected set of tiles was tested for radioactivity, including tritium contamination. The tiles were grit blasted in a negative-pressure blasting cabinet using 37 μm boron carbide powder as the blast media and dry nitrogen as the propellant.

2749 (GA-A–21428) **Investigation of collisional effects within the bending magnet region of a DIII-D neutral beamline.** Kessler, D.N.; Hong, R.; Kellman, D.H. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–3: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001103. Source: OSTI; NTIS; INIS; GPO Dep.

The region between the pole faces of the DIII-D neutral beamline residual ion bending magnets is an area of transient high gas pressure which may cause beam defocusing and increased heating of beamline internal components due to collisional effects. An investigation of these effects helps in understanding residual ion trajectories and in providing information for studying in the beamline capability for operation with increased pulse duration. Examination of collisional effects, and of the possible existence of space charge blow-up, was carried out by injecting deuterium gas into the region between the magnet pole faces with rates varying from 0 to 18 torr-ℓ/sec. Thermocouple and waterflow calorimetry data were taken to measure the beamline component heating and beam powder deposition on the magnet pole shields, magnet louvers, ion dump, beam collimators, and calorimeter. Data was also taken at gas flow rates varying from 0 to 25 torr-ℓ/sec into the neutralizer

cell and is compared with the magnet region gas injection data obtained. Results show that both collisional effects and space charge blow-up play a role in magnet region component heating and that neutralizer gas flow sufficiently reduces component heating without incurring unacceptable power losses through collisional effects.

2750 (GA-A–21429) **ICH rf system data acquisition and real time control using a microcomputer system.** Cary, W.P.; Allen, J.A.; Pinsker, R.I.; Petty, C.C. General Atomics, San Diego, CA (United States). Oct 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. Order Number DE94001112. Source: OSTI; NTIS; INIS; GPO Dep.

On the basis of the rapidly increasing power, speed, and decreasing cost of the personal computer (microcomputer) it was felt that a real time data acquisition and control system could be configured quickly and very cost effectively. It was further felt that by using a high level or object-oriented programming language that considerable time and expense could be saved and at the same time increase system flexibility. This paper will attempt to address the desired system requirements and performance for both the control of the high power transmitters and for the data acquisition and presentation of the information.

2751 (GA-A–21437) **Beam species mix as a function of DIII-D neutral beam ion source operation parameters.** Riggs, S.P.; Hong, R. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–19: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001105. Source: OSTI; NTIS; INIS; GPO Dep.

By measuring the Balmer-alpha emission for deuterium, Doppler-shifted spectroscopy (DSS) can give relative fractions of the ions D+, D2+, D3+ (species mix) produced by the DIII-D neutral beam ion sources. The species mix varies with beam energy, arc power, gas flow rate, and time within a beam pulse. The full energy species fraction gets larger and tends to become constant with increasing beam energy while the third energy species tends to decrease. Varying the neutralizer flow rate between 0 and 20 torr-ℓ/sec causes the full energy species fraction to decrease by ~0.04 in favor of more third energy particles. Measurements made at various times within a beam pulse showed that the species fraction normally varies by about 0.02 but can have a variation of as much as 0.14. The effect of the beam parameters on the species mix varies slightly between ion sources. Bach of the beam species has a different neutralization efficiency. Thus, the neutral beam power injected into the tokamak depends on the species mix. The neutrausation fraction (and the total injected power) obtained using beam species as measured by DSS at a beam energy of 80 keV is 4% lower than previously believed. This difference becomes aniaber with decreasing beam energy until they converge at 50 keV.

2752 (GA-A–21439) **Operational upgrades to the DIII-D 60 GHz electron cyclotron resonant heating system.** Harris, T.E.; Cary, W.P. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–10: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001098. Source: OSTI; NTIS; INIS; GPO Dep.

One of the primary components of the DIII-D radio frequency (rf) program over the past seven years has been the 60 GHz electron cyclotron resonant heating (ECRH) system. The system now consists of eight units capable of operating and controlling eight Varian VGE-8006 60 GHz, 200 kW gyrotrons along with their associated waveguide components. This paper will discuss the operational upgrades and the overall system performance. Many modifications were instituted to enhance the system operation and performance. Modifications discussed in this paper include an improved gyrotron tube-fault response network, a computer controlled pulse-timing and sequencing system, and an improved high-voltage power supply control interface. The discussion on overall system performance will include operating techniques used to improve system operations and reliability. The techniques discussed apply to system start-up procedures, operating the system in a conditioning mode, and operating the system during DIII-D plasma operations.

2753 (GA-A–21440) **Impact of environmental regulations on control of copper ion concentration in the DIII-D cooling water system.** Gootgeld, A.M. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-931018–2: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001102. Source: OSTI; NTIS; INIS; GPO Dep.

Tokamaks and industrial users are faced with the task of maintaining closed-loop, low conductivity, low impurity, cooling water systems. Operating these systems concentrates the impurities in the water requiring subsequent disposal. Environmental regulations are making this increasingly difficult. This paper will discuss the solution to the problem of removing and disposing of copper ions in the DIII-D low conductivity water system. Since the commissioning of the Doublet facility, the quality of the water in the 3000 gpm system that cools the DIII-D vacuum vessel coils, power supplies and auxiliary heating components has been controlled with mixed-bed ion exchangers. Low ion levels, particularly copper, are required to operate this equipment. In early 1992, the company that leases and regenerates DIII-D ion exchangers said they no longer can accept these resin beds for regeneration due to the level of copper ion on the resin. This change in policy, a change that has been adopted throughout their industry, was necessary to assure that the Metropolitan Sewerage System of the City of San Diego stays in compliance with State of California regulations and EPA-mandated national pretreatment standards and regulations. A cost effective solution was implemented which utilizes a reverse osmosis filtration system with the ion exchangers for make-up water. Levels of copper ion disposed to the sewer are in compliance with government standards. These measures have thus far proved effective in maintaining low conductivity and overall good quality cooling water. Specifically, this paper discusses DIII-D deionized cooling water quality requirements and an affective means to meet these requirements in order to be in compliance with government regulations for copper ion disposal. The problems discussed, the alternatives considered and the approach taken would be readily applicable to any deionized cooling water system containing copper where EPA standards and regulations are mandated.

2754 (GA-A–21446) **Implementation of a quasi-realtime display of DIII-D neutral beam heating waveforms.** Phillips, J.C. General Atomics, San Diego, CA (United States). Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. Order Number DE94001195. Source: OSTI; NTIS; INIS; GPO Dep.

The DIII-D neutral beam system employs eight 80 keV ion sources mounted on four beamlines to provide plasma heating to the DIII-D tokamak. The neutral beam system is capable of injecting over 20 MW of deuterium power with flexibility in terms of timing and modulation of the individual neutral beams. To maintain DIII-D's efficient tokamak shot cycle and make informed control decisions, it is important to be able to determine which beams fired, and exactly when, by the time the tokamak shot is over. Previously this information was available in centralized form only after a several minute wait. A cost-effective alternative to the traditional eight-channel storage oscilloscope has been implemented using off the shelf PC hardware and software. The system provides a real time display of injected neutral beam accelerator voltages and tokamak plasma current, as well an a summation waveform indicative of the total injected power as a function of time. The hardware consists of a Macintosh Centris 650 PC with a Motorola 68040 microprocessor. Data acquisition is accomplished using a National Instrument's 16-channel analog to digital conversion board for the Macintosh. The color displays and functionality were developed using National Instruments' LabView environment. Because the price of PCs has been decreasing rapidly and their capabilities increasing, this system is far less expensive than an eight-channel storage oscilloscope. As a flexible combination of PC and software, the system also provides much more capability than a dedicated oscilloscope, acting as the neutral beam coordinator's logbook, recording comments and availability statistics. Data such as shot number and neutral beam parameters are obtained over the local network from other computers and added to the display. Waveforms are easily archived to disk for future recall. Details of the

implementation will be discussed along with samples of the displays and a description of the system's function and capabilities.

2755 (INIS-mf–13584) **ITER EDA newsletter. V. 2, Nos. 7/8.** International Atomic Energy Agency, Vienna (Austria). 1993. 8p. Order Number DE94603958. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue includes a description of the ITER Design Integration Division, and reports on the 5th IAEA Technical Committee Meeting on Developments in Fusion Safety held in Toronto, Canada, 7 - 11 June 1993, and on the International Atomic Energy Agency's Atomic and Plasma-Material Interaction Data Activities in support of the ITER Engineering Design Activities.

2756 (IPPCZ–321) **Progress in Z-pinchs research.** Ceskoslovenska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. May 1992. 23p. (CONF-920638–: 19. Institute of Electrical and Electronic Engineers (IEEE) international conference on plasma science, Tampa, FL (United States), 1-3 Jun 1992). Order Number DE93619992. Source: OSTI; NTIS (US Sales Only); INIS.

The papers were processed separately for the data base.

2757 (JAERI-M–93-123) **Design study of a time-of-flight neutron spectrometer for JT-60U.** Elevant, T. (Royal Inst. of Tech., Stockholm (Sweden). Alfven Lab.); Hoek, M.; Nishitani, Takeo. Japan Atomic Energy Research Inst., Tokyo (Japan). Jun 1993. 26p. Order Number DE94718957. Source: OSTI; NTIS; INIS.

A time-of-flight neutron spectrometer is proposed for measurements of neutron energy spectra from deuterium-deuterium reactions in JT-60U tokamak plasmas. The sensitivity of the instrument is $2 \cdot 10^{-2} cm^2$, energy resolution is 4.5 % (FWHM) and maximum useful count-rate is 6 kHz. Analysis of neutron energy spectra will provide information on central ion temperatures larger than $\approx$ 4 keV with an accuracy of $\pm$ 10 %, and neutron source fraction from reactions between thermal ions with an accuracy of $\pm$ 15 %. The minimum time required for data acquisition is 0.1 s. (author).

2758 (JAERI-M–93-130) **Improvement study of the divertor configuration of the Steady State Tokamak Reactor (SSTR).** Moriyama, Kouki (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Seki, Yasushi; Nishino, Toru; Yamazaki, Seiichirou. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 77p. (In Japanese). Order Number DE94718961. Source: OSTI; NTIS; INIS.

The divertor configuration improvement of the Steady State Tokamak Reactor (SSTR) was studied. In the study, lower temperature and higher density divertor plasma was aimed at to reduce the peak heat flux to the divertor plate, by adding baffle plates near the divertor plasma, or by providing slots to the divertor plates. The divertor plasmas were simulated for the conventional divertor configuration employed in the SSTR design, the one with baffle plates added, the one with exhaust duct in the bottom direction called the private side pumping, and gas target in slot divertor configuration. The divertor plasma characteristics were analyzed and evaluated using the numerical simulation code, UEDA. As the result, the divertor configuration with baffle plates is found to be superior in lowering the temperature, increasing the particle density of the divertor plasma and in reducing the peak heat flux. On the other hand, the gas divertor in the slot configuration and private side pumping divertor configuration are both found to have major difficulties. (author).

2759 (JAERI-M–93-132) **Production of high current H^- beams in a cesium seeded volume negative ion source equipped with PG filter.** Tanaka, Masanobu (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Hanada, Masaya; Inoue, Takashi; Okumura, Yoshikazu. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 30p. (In Japanese). Order Number DE94718962. Source: OSTI; NTIS; INIS.

For neutral beam injectors of fusion reactors, it is required to produce uniform high current H^- beams with large cross section. To realize this requirement, we have developed a large volume-production type negative ion source equipped with a uniform electromagnetic filter called PG filter, where a transverse magnetic field is generated by the current flowing in a plasma grid (PG). In this experiment, we tested PG filter with cesium for the first time and obtained maximum H^- beam current of 7A (26 mA/cm^2) at an arc power of 35 kV (70V, 500A). This efficiency of H^- production is better than that of external filter and other type of filters. At a very low filling pressure (0.3 Pa) in the negative ion generator, H^- beam of 4.4A (16 mA/cm^2) was produced. It satisfies the design value of the negative ion source for JT-60U. Investigated were the optimum magnetic filter strength in a cesium seeded condition, the extracted electron current that gives electrodes heat load and the beam bending angle by the magnetic filter field, which are useful for the design of future large negative ion sources. (author).

2760 (JAERI-M–93-141) **Two-dimensional over-all neutronics analysis of the ITER device.** Zimin, S. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Takatsu, Hideyuki; Mori, Seiji; Seki, Yasushi; Satoh, Satoshi; Tada, Eisuke; Maki, Koichi. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 83p. Order Number DE94718963. Source: OSTI; NTIS; INIS.

The present work attempts to carry out a comprehensive neutronics analysis of the International Thermonuclear Experimental Reactor (ITER) developed during the Conceptual Design Activities (CDA). The two-dimensional cylindrical over-all calculational models of ITER CDA device including the first wall, blanket, shield, vacuum vessel, magnets, cryostat and support structures were developed for this purpose with a help of the DOGII code. Two dimensional DOT 3.5 code with the FUSION-40 nuclear data library was employed for transport calculations of neutron and gamma ray fluxes, tritium breeding ratio (TBR) and nuclear heating in reactor components. The induced activity calculational code CINAC was employed for the calculations of exposure dose rate after reactor shutdown around the ITER CDA device. The two-dimensional over-all calculational model includes the design specifics such as the pebble bed Li_2O/Be layered blanket, the thin double wall vacuum vessel, the concrete cryostat integrated with the over-all ITER design, the top maintenance shield plug, the additional ring biological shield placed under the top cryostat lid around the above-mentioned top maintenance shield plug etc. All the above-mentioned design specifics were included in the employed calculational models. Some alternative design options, such as the water-rich shielding blanket instead of lithium-bearing one, the additional biological shield plug at the top zone between the poloidal field (PF) coil No.5 and the maintenance shield plug, were calculated as well. Much efforts have been focused on analyses of obtained results. These analyses aimed to obtain necessary recommendations on improving the ITER CDA design. (author).

2761 (JAERI-M–93-145) **Effect of helium on separation performance of cryogenic distillation column cascade for fusion reactor.** Yamanishi, Toshihiko (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Okuno, Kenji. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1993. 21p. Order Number DE94718966. Source: OSTI; NTIS; INIS.

The effect of helium in the feed stream on separation performance of the cryogenic distillation columns was discussed in a probable case. The column cascade at Los Alamos National Laboratory was chosen in the present study. The new data for solubility of helium in liquid hydrogen isotopes was used in the present study. Column (2) is mainly affected by the presence of helium in the fuel stream. If the helium percentage in the feed stream is 1%, the column performance can be assured by increasing the condenser load: a larger inner diameter of the column; larger flow rate of the refrigerant gas; and larger heat transfer area at the condenser should be considered. If the percentage is 5%, both the column pressure and condenser load must be doubled in the steady-state operation. These results qualitatively agreed with the simulation results by Kinoshita in which the old data for solubility of helium were used. (author).

2762 (LA-SUB–93-304) **Final report on optical damage tests.** Los Alamos National Lab., NM (United States); KMS Fusion,

Inc., Ann Arbor, MI (United States). 18 May 1990. 58p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94001471. Source: OSTI; NTIS; GPO Dep.

This report presents the data resulting from a series of mirror damage tests conducted with the FLEX laser at KMS Fusion on March 14 through March 20, 1990 for Los Alamos National Laboratory. The FLEX laser consists of a ND:YLF master oscillator and four Nd:glass rod amplifiers operating at 1.05 μm. For this program, the laser was configured to produce a 3 ms long square wave envelope of mode locked pulses which was focused onto Los Alamos supplied targets via a 1200 mm focal length (f/20) lens at approximately normal incidence. The pulse energy and spot size were specified by Los Alamos personnel, the energy varying from approximately 10–40 Joules and the spot size ranging from approximately 100–300 μm. A total of 63 target shots and 19 calibration and/or test shots were conducted.

2763 (LA-UR–89-2675-Vol.1) **Inertial Confinement Fusion at Los Alamos: Volume 1, Progress in Inertial Confinement Fusion since 1985.** Cartwright, D.C. (comp.). Los Alamos National Lab., NM (United States). Sep 1989. 194p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040030. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics on Inertial Confinement Fusion: ICF contributions to science and technology; target fabrication; laser-target interaction; KrF laser development; advanced KrF lasers; KrF laser technology; and plasma physics for light-ion program.

2764 (LA-UR–89-2675-Vol.2) **Inertial Confinement Fusion at Los Alamos: Volume 2, The physics and chemistry of electron-beam pumped KrF lasers.** Cartwright, D.C. (comp.). Los Alamos National Lab., NM (United States). Sep 1989. 178p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93040031. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics on inertial confinement fusion: distribution of electron-beam energy in KrF laser media; electron collision processes in KrF laser media; Krf laser kinetics; and properties of the KrF laser medium.

2765 (LA-UR–93-2870) **Next-Step scientific objectives, targets, and parameters for reversed-field-pinch (RFP) magnetic fusion energy (MFE) systems: Preliminary thoughts.** Krakowski, R.A.; Bathke, C.G.; DiMarco, J.N.; Miller, R.L.; Werley, K.A. Los Alamos National Lab., NM (United States). 20 Jul 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309216–1: Reverse field pinch (RFP) planning meeting, Padova (Italy), 20-24 Sep 1993). Order Number DE93040250. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is the quantitative definition of objectives, targets, and parameters of the Next-Step device to follow the present RFX experiment; this device is given the name RFXNS. Although developed over five years ago, much of the material distilled into the 1988 RFP tactical plan is useful in establishing the goals and parameters of RFXNS. This earlier plan established tentative parameters of an RFP next step based on: predictions of RFP ignition and commercial-reactor devices; and the assumed successful operation of highly complementary RFP experiments RFX and ZTH/CPRF. Programmatic changes and evolution that have occurred since 1988 strongly impact the role and characteristics of an RFXNS: the Los Alamos ZTH/CPRF project and fusion program was terminated in mid-construction for reasons of MFE cost savings and concept focusing; great progress has been made in launching ITER; and reactor projections for the tokamak have increased in detail and variety, but not in commercial promise and competitiveness. A brief status of and perspective from each of the above three points is necessary before the key issues and their implementation to form the basis of the RFXNS definition are given.

2766 (LA-UR–93-2951) **Calculation of displacement, gas, and transmutation production in stainless steel irradiated with spallation neutrons.** Wechsler, M.A. (Iowa State Univ. of Science and Technology, Ames, IA (United States)); Ramavarapu, R.; Daugherty, E.L.; Palmer, R.C.; Bullen, D.B.; Sommer, W.F. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930928–4: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE93040105. Source: OSTI; NTIS; INIS; GPO Dep.

Calculations using the high-energy transport code LAHET have been made for the production of displacements, helium gas, and transmuted atoms for stainless steel (Fe-18 wt % Cr-10 wt % Ni) irradiated with spallation neutrons at energies of 100 to 1600 MeV. The damage energy cross section increased from about 250 to 350 b keV for increasing neutron energies from 100 to 1600 MeV with a spallation spectrum average of 281 barns-keV. For a displacement threshold energy of 33 eV, the corresponding spectrum-average displacement cross section is 3400 barns. The PKA spectrum was found to be fairly independent of the incident neutron energy, with an average damage energy of 0.25–0.30 MeV. The helium production cross section increased monotonically with increasing neutron energy, with a spectrum average of 0.32 barns. The maximum transmutation yield was observed near manganese (Z = 25), corresponding to a production cross section of about 0.2 barns. Relevance to fusion materials is discussed.

2767 (LA-UR–93-3396) **The effect of processing parameters on plasma sprayed beryllium for fusion applications.** Castro, R.G. (Los Alamos National Lab., NM (United States)); Stanek, P.W.; Jacobson, L.A.; Cowgill, D.F.; Snead, L.L. Los Alamos National Lab., NM (United States). [1993]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310182–1: Workshop on beryllium for fusion applications, Karlsruhe (Germany), 4-5 Oct 1993). Order Number DE94000823. Source: OSTI; NTIS; INIS; GPO Dep.

Plasma spraying is being investigated as a potential coating technique for applying thin (0.1–5mm) layers of beryllium on plasma facing surfaces of blanket modules in ITER and also as an in-situ repair technique for repairing eroded beryllium surfaces in high heat flux divertor regions. High density spray deposits (>98% of theoretical density) of beryllium will be required in order to maximize the thermal conductivity of the beryllium coatings. A preliminary investigation was done to determine the effect of various processing parameters (particle size, particle morphology, secondary gas additions and reduced chamber pressure) on the as-deposited density of beryllium. The deposits were made using spherical beryllium feedstock powder which was produced by centrifugal atomization at Los Alamos National Laboratory (LANL). Improvements in the as-deposited densities and deposit efficiencies of the beryllium spray deposits will be discussed along with the corresponding thermal conductivity and outgassing behavior of these deposits.

2768 (LA-UR–93-3452) **Design of a target and moderator at the Los Alamos Spallation Radiation Effects Facility (LASREF) as a neutron source for fusion reactor materials development.** Ferguson, P.D. (Univ. of Missouri, Rolla, MO (United States). Dept. of Nuclear Engineering); Mueller, G.E.; Sommer, W.F.; Farnum, E.H. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930809–8: 8. ASTM-EURATOM symposium on reactor dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE94000699. Source: OSTI; NTIS; INIS; GPO Dep.

The LASREF facility is located in the beam stop area at LAMPF. The neutron spectrum is fission-like with the addition of a 3% to 5% component with E > 20 MeV. The present study evaluates the limits on geometry and material selection that will maximize the neutron flux. MCNP and LAHET were used to predict the neutron flux and energy spectrum for a variety of geometries. The problem considers 760 MeV protons incident on tungsten. The resulting neutrons are multiplied in uranium through (n,xn) reactions. Calculations show that a neutron flux greater than 10^{19} n/m^2/s is achievable. The helium to dpa ratio and the transmutation product generation are calculated. These results are compared to expectations for the proposed DEMO fusion reactor and to FFTF.

2769 (LA-UR–93-3648) **Three tritium systems test assembly (TSTA) off-loop experiments.** Talcott, C.L. (Los Alamos National Lab., NM (United States)); Anderson, J.L.; Carlson, R.V.; Coffin, D.O.; Walthers, C.R.; Hamerdinger, D.; Binning, K.; Trujillo,

R.D.; Moya, J.S.; Hayashi, T.; Okuno, K.; Yamanishi, T. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); Japan Atomic Energy Research Inst., Tokyo (Japan). DOE Contract W-7405-ENG-36. (CONF-931018–43: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002711. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results from three different experiments. Experiment one was initiated to establish the possibility of using a soft elastomer in ITER (International Thermonuclear Experimental Reactor) applications. Used in this application, the sealing material is anticipated to be in tritium at pressures in the range of 1×10^{-3} torr for many years. Here two O-ring valve seals each of Viton-A, Buna-N, and EDPM were exposed to 1, 40, 400 torr of tritium while being cycled open and closed approximately 11,500 times in 192 days. EDPM is the least susceptible to damage from the tritium. Both Buna-N and Viton-A showed deterioration following the first cycling at 400 torr. Using commercially available materials, the Tritium Systems Test Assembly (TSTA) designed and built a Portable Water Removal (PWR) Unit to reduce tritium oxide emissions during glovebox breaches. the PWR removes 99.9% of all tritium and saves between 0.7 and 3.5 curies of tritium oxide from being stacked during each of the five tests. Finally, a series of tests are done to determine whether the presence of SF_6 changes the ability of palladium and platinum to catalyze the T_2-O_2 reaction to form T_2O. No deterioration of the catalytic activity is observed. This is important because the Tokamak Fusion Test Reactor (TFTR) requires information about the effect of SF_6, an electrical insulator, on the catalytic behavior of Pt and Pd in a T_2 environment. This information is necessary for the accident analysis in the Safety Analysis Report for TFTR. This study is done using an apparatus supplied to TSTA by TFTR.

2770 (LA-UR–93-3677) **Tokamak Physics Experiment (TPX) cost and performance trade studies using supercode.** Miller, R.L. (Los Alamos National Lab., NM (United States)); Galambos, J.D.; Haney, S.W.; Perkins, L.J.; Mandrekas, J. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931018–42: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002720. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment (TPX) has been proposed to demonstrate steady-state operation and to develop advanced performance in terms of β and energy confinement. Major TPX cost drivers and the impact of physics and technology constraints and options on operating scenarios are identified. Key trade and sensitivity studies performed using SuperCode are summarized.

2771 (LBL–34107) **Emittance growth rates for displaced beams.** Anderson, O.A. (Lawrence Berkeley Lab., CA (United States)). Lawrence Berkeley Lab., CA (United States). May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (HIFAN–576;CONF-9305136–13: International symposium on heavy ion fusion, Frascati (Italy), 25-28 May 1993). Order Number DE93040299. Source: OSTI; NTIS; INIS; GPO Dep.

Emittance growth rates have been previously analyzed for nonuniform beams in linear channels and for initially uniform mismatched beams in nonlinear channels. These studies were for centered beams. Additional emittance growth can arise in cases where the beam is initially displaced. The purpose of this study is to obtain growth rates for displaced beams. This work differs from studies involving random displacement of electrodes. Our analysis assumes instead that the focusing system is perfectly aligned but that the beam is initially displaced with respect to the equilibrium axis. If the focusing force is slightly nonlinear, we find a gradual transfer of the potential energy of beam displacement into kinetic energy associated with emittance growth. We present explicit results for the emittance growth distance as a function of the nonlinearity of the channel. These results will have practical importance for designers of accelerators and transport systems when setting realistic tolerances for initial beam alignment. These tolerances will depend on the nonlinearity and the length of the system.

2772 (LBL–34254) **Heavy-Ion Fusion Accelerator Research, 1992.** Lawrence Berkeley Lab., CA (United States). Jun 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94002265. Source: OSTI; NTIS; INIS; GPO Dep.

The National Energy Strategy calls for a demonstration IFE power plant by the year 2025. The cornerstone of the plan to meet this ambitious goal is research and development for heavy-ion driver technology. A series of successes indicates that the technology being studied by the HIFAR Group – the induction accelerator – is a prime candidate for further technology development toward this long-range goal. The HIFAR program addresses the generation of high-power, high-brightness beams of heavy ions; the understanding of the scaling laws that apply in this hitherto little-explored physics regime; and the validation of new, potentially more economical accelerator strategies. Key specific elements to be addressed include: fundamental physical limits of transverse and longitudinal beam quality; development of induction modules for accelerators, along with multiple-beam hardware, at reasonable cost; acceleration of multiple beams, merging of the beams, and amplification of current without significant dilution of beam quality; final bunching, transport, and focusing onto a small target. In 1992, the HIFAR Program was concerned principally with the next step toward a driver: the design of ILSE, the Induction Linac Systems Experiments. ILSE will address most of the remaining beam-control and beam-manipulation issues at partial driver scale. A few parameters – most importantly, the line charge density and consequently the size of the ILSE beams – will be at full driver scale. A theory group closely integrated with the experimental groups continues supporting present-day work and looking ahead toward larger experiments and the eventual driver. Highlights of this long-range, driver-oriented research included continued investigations of longitudinal instability and some new insights into scaled experiments with which the authors might examine hard-to-calculate beam-dynamics phenomena.

2773 (LBL–34415) **Linear induction accelerators for fusion and neutron production.** Barletta, W.A. (Lawrence Berkeley Lab., CA (United States)). Lawrence Berkeley Lab., CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9308168–1: International seminar on planetary emergencies, Erice (Italy), 19-24 Aug 1993). Order Number DE93040288. Source: OSTI; NTIS; INIS; GPO Dep.

Linear induction accelerators (LIA) with pulsed power drives can produce high energy, intense beams or electrons, protons, or heavy ions with megawatts of average power. The continuing development of highly reliable LIA components permits the use such accelerators as cost-effective beam sources to drive fusion pellets with heavy ions, to produce intense neutron fluxes using proton beams, and to generate with electrons microwave power to drive magnetic fusion reactors and high gradient, rf-linacs.

2774 (NIFS–177) **Design study of LHD helical divertor and high temperature divertor plasma operation.** Ohyabu, N. (and others); Yamazaki, K.; Katanuma, I. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 16p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/C-4-2). Order Number DE94718975. Source: OSTI; NTIS; INIS.

The Large Helical device (LHD), now under construction is a Heliotron/torsatron device with a closed divertor system. The LHD divertor magnetic structure has been studied in detail. A peculiar feature of the configuration is the existence of edge surface layers, a complicated three dimensional magnetic structure. However it does not seem to hamper the expected divertor functions. As a confinement improvement scheme in LHD, we have proposed a high temperature divertor plasma operation in which a divertor plasma with a temperature of a few kev, generated by efficient pumping, leads to the confinement improvement. (author).

2775 (NIFS–180) **D-^{3}He fueled FRC reactor 'ARTEMIS-L'.** Momota, Hiromu; Tomita, Yukihiro; Ishida, Akio; Kohzaki, Yasuji; Nakao, Yasuyuki; Nishikawa, Masabumi; Ohi, Shoichi; Ohnishi, Masami. National Inst. for Fusion Science, Nagoya (Japan). Sep

1992. 13p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/G-1-1-3(R)). Order Number DE94718979. Source: OSTI; NTIS; INIS.

A neutron-lean D-^{3}He fueled field reversed configuration (FRC) fusion reactor is studied on the bases of former high-efficiency ARTEMIS design. Certain improvements such as effective axial contracting plasma heating and cusp-type direct energy converters as well as an empirical scale of the energy confinement are introduced. The resultant total neutron load onto the first wall of the plasma chamber is as low as 0.1 MW/m^2, which enable the life of the first wall or the structural materials to be longer than the whole life of the reactor. The attractive characteristics of the neutron-lean reactor follow in the ARTEMIS design: it is socially acceptable in views of radioactivity and fuel resources, and the cost of electricity appears to be cheap compared with that from a light water reactor. Critical physics and engineering issues for performing the ARTEMIS-L reactor are clarified. (author).

2776 (NIFS–186) **A role of neutral hydrogen in CHS plasmas with reheat and collapse and comparison with JIPPT-IIU tokamak plasmas.** Morita, S. (and others); Yamada, H.; Iguchi, H. National Inst. for Fusion Science, Nagoya (Japan). Sep 1992. 16p. (CONF-9209396–: 14. international conference on plasma physics and controlled nuclear fusion research, Wuerzburg (Germany), 30 Sep - 7 oct 1992; IAEA-CN–56/C-2-5). Order Number DE94718985. Source: OSTI; NTIS; INIS.

Results are described on NBI plasmas of the Compact Helical System (CHS). An increase in the stored energy, which is called plasma 'reheat', is observed with density peaking when gas puffing is turned off in the high density region. A plasma collapse with large increase in radiation loss occurs even in discharges whose Z_{eff} values (typically, less than 2-3) do not show any increase when the gas puffing is continued. Both phenomena are basically explained by the edge electron temperature due to the difference in the amount of edge hydrogen neutrals. After turning off the gas puffing, the central electron density n_{e0} shows an increase of 80% and the density peaking factor (n_{e0}/n-bar$_e$) changes from 1.0 to 2.0, in typical cases, and a high inward velocity of the impurities appears (v = 20 m/s). The accumulation is studied in relation to the poloidal rotation and the edge temperature. These results are compared with results from plasmas with IOC- and H-modes in the JIPPT-IIU tokamak. (author).

2777 (NIIEFA-P–0908) **Radiation transport and focusing systems for power industrial lasers.** Alekseev, I.A.; Baranov, G.A.; Zinchenko, A.K. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1992. 19p. (In Russian). Order Number DE94606817. Source: OSTI; NTIS (US Sales Only); INIS.

Basic principles of setting up multiposted systems of radiation transport and focusing are discussed. Development of certain unified units, from which various systems of transport and focusing are composed, is reported, their main performances being given. Standard units, including stationary revolving mirrors, optical switches for one or two beams, universal posts, etc., permitting assembly and flexible rearrangement of radiation transport systems of several powerful lasers to a number of technological posts.

2778 (PPPL-CFP–2963) **Decommissioning the Tokamak Fusion Test Reactor.** Spampinato, P.T. (Grumman Corp. (United States)); Walton, G.R. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–14: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001494. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Fusion Test Reactor (TFTR) at Princeton Plasma Physics Laboratory (PPPL) will complete its experimental lifetime with a series of deuterium-tritium pulses in 1994. As a result, the machine structures will become radioactive, and vacuum components will also be contaminated with tritium. Dose rate levels will range from less than 1 mr/h for external structures to hundreds of mr/h for the vacuum vessel. Hence, decommissioning operations will range from hands on activities to the use of remotely operated equipment. After 21 months of cool down, decontamination and decommissioning (D and D) operations will commence and continue for approximately 15 months. The primary objective is to render the test cell complex re-usable for the next machine, the Tokamak Physics Experiment (TPX). This paper presents an overview of decommissioning TFTR and discusses the D and D objectives.

2779 (PPPL-CFP–2965) **Special remote tooling developed and utilized to tighten TFTR TF coil casing bolts.** Burgess, T.W. (Oak Ridge National Lab., TN (United States)); Walton, G.R.; Meighan, T.G.; Paul, B.L. Princeton Univ., NJ (United States). Plasma Physics Lab.; Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073 ;AC05-84OR21400. (CONF-931018–15: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94001496. Source: OSTI; NTIS; INIS; GPO Dep.

Special tooling has been developed and used to tighten toroidal field (TF) coil casing bolts that have loosened from years of Tokamak Fusion Test Reactor (TFTR) operation. Due to their location, many of the TF casing bolts cannot be directly accessed or viewed; their condition was first discovered during unrelated inspections in 1988. Engineering solutions were, sought until 1992, when a remotely operated wrench concept was successfully demonstrated on a TF coil mockup. The concept was developed into several working tools that have successfully been applied to tighten several thousand TF casing bolts during recent scheduled outages. This effort has improved the integrity and reliability of the TF coil system in preparing for the final experimental phase of the TFTR. This paper discusses the design and application of this tooling.

2780 (PPPL-CFP–2971) **TPX assembly plan.** Knutson, D. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–24: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002231. Source: OSTI; NTIS; INIS; GPO Dep.

The TPX machine will be assembled in the TFTR Test Cell at the Plasma Physics Laboratory, utilizing the existing TFTR machine foundation. Preparation of the area for assembly will begin after completion of the decontamination and decommissioning phase on TFTR and certification that the radiation levels remaining, if any, are consistent with the types of operations planned. Assembly operations begin with the arrival of the first components, and conclude, approximately 24 months later, with the successful completion of the integrated systems tests and the achievement of a first plasma.

2781 (PPPL-CFP–2973) **Plasma vertical stability and feedback control for TPX.** Kessel, C.E; Jardin, S.C.; Neilson, G.H. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–27: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002233. Source: OSTI; NTIS; INIS; GPO Dep.

The n=0 axisymmetric vertical stability and vertical position control have been examined for the Tokamak Physics Experiment. The passive stabilization is accomplished by using stabilizer plates close to the plasma. The present configuration is found to provide robust stability over wide range of plasma parameters. The active feed-back control of the plasma vertical position is done using coils located inside the vacuum vessel. These are required to control random disturbances leading to $\leq$ 1.0 cm RMS displacements from the midplane, and acceptable coil currents and voltages are found.

2782 (PPPL-CFP–2975) **The engineering design of TPX.** Reiersen, W.T. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–25: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002235. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment (TPX) is designed to develop the scientific basis for a compact and continuously operating tokamak fusion reactor. TPX has a long pulse (1000s) capability, can accommodate high divertor heat loads, has a flexible PF system,

and auxiliary heating and current drive systems that make it an ideal test bed for development of attractive reactor concepts. The design incorporates superconducting magnets in both the toroidal and poloidal field magnets. Long pulse deuterium operation will produce 6 x 10^{21} neutrons per year requiring remote maintenance of the in-vessel hardware. This paper provides an overview of the TPX Project and describes the design approach with emphasis on salient features of the tokamak.

2783 (PPPL-CFP–2976) **TPX/TFTR Neutral Beam energy absorbers.** Dahlgren, F.; Wright, K.; Kamperschroer, J.; Grisham, L.; Lontai, L.; Peters, C.; VonHalle, A. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–35: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002236. Source: OSTI; NTIS; INIS; GPO Dep.

The present beam energy absorbing surfaces on the TFTR Neutral Beams such as Ion Dumps, Calorimeters, beam defining apertures, and scrapers, are simple water cooled copper plates which wee designed to absorb (via their thermal inertia) the incident beam power for two seconds with a five minute coal down interval between pulses. These components are not capable of absorbing the anticipated beam power loading for 1000 second TPX pulses and will have to be replaced with an actively cooled design. While several actively cooled energy absorbing designs were considered,, the hypervapotron elements currently being used on the JET beamlines were chosen due to their lower cooling water demands and reliable performance on JET.

2784 (PPPL-CFP–2981) **TFTR DT preparation project status.** Perry, E.D.; Dudek, L.E. Princeton Univ., NJ (United States). Plasma Physics Lab. [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-931018–33: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002241. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Fusion Test Reactor (TFTR) research program is preparing to commence the first high power Deuterium-Tritium (DT) experiments of the US Fusion Program. Hardware upgrades to TFTR required for DT operations have been completed. This paper discusses these hardware preparations.

2785 (PPPL-CFP–2985) **[Recent results and near term expectations in tokamak research in the US, Europe and Japan].** Meade, D. Princeton Univ., NJ (United States). Plasma Physics Lab. 23 Jun 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-9306204–4: Project energy '93, Kansas City, MO (United States), 21-23 Jun 1993). Order Number DE94002224. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the scientific and economic feasibility of fusion energy, especially in regards to the tokamak reactor.

2786 (PPPL-Q–49) **Princeton University Plasma Physics Laboratory, Princeton, New Jersey: Annual report, October 1, 1990–September 30, 1991.** Princeton Univ., NJ (United States). Plasma Physics Lab. [1991]. 212p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94000540. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics: Principal parameters of experimental devices; Tokamak Fusion Test Reactor; Burning Plasma Experiment; Princeton Beta Experiment-Modification; Current Drive Experiment-Upgrade; International Thermonuclear Experimental Reactor; International Collaboration; X-Ray Laser Studies; Hyperthermal Atomic Beam Source; Pure Electron Plasma Experiments; Plasma Processing: Deposition and Etching of Thin Films; Theoretical Studies; Tokamak Modeling; Engineering Department; Environment, Safety, and Health and Quality Assurance; Technology Transfer; Office of Human Resources and Administration; PPPL Patent Invention Disclosures; Office of Resource Management; Graduate Education: Plasma Physics; Graduate Education: Program in Plasma Science and Technology; and Science Education Program.

2787 (SAND–93-1026C) **Lithium thermal targets shot on PBFA II.** Sawyer, P.S. (Ktech Corp., Albuquerque, NM (United States)); Aubert, J.H.; Baca, P.M.; McNamara, W.F. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9305283–2: 9. target fabrication specialists meeting, Monterey, CA (United States), 9 May 1993). Order Number DE93041139. Source: OSTI; NTIS; GPO Dep.

Recent lithium ion beam experiments on PBFAII have required intricate targets to measure beam performance and to study target physics issues. Because of the stopping power difference between lithium ions and protons, these targets have presented significantly increased challenges for material preparation and handling compared to previous proton shots. The greatest challenges included complex shaped gold hohlraums, CH foams of densities ranging from 3 to 6 mg/cm3 and vacuum seals covering large areas with a thickness under 1 um. Details regarding assembly and characterization of lithium thermal targets will be described in this poster.

2788 (UCRL-JC–111445) **Phase screens for the control of the focal irradiance of the Nova laser.** Lawson, J.K.; Dixit, S.N.; Eimerl, D.; Henesian, M.A.; Manes, K.R.; Morgan, A.J.; Powell, H.T.; Thomas, I.M.; Trenholme, J.B.; Woods, B.W. Lawrence Livermore National Lab., CA (United States). 17 Sep 1993. 9p. Sponsored by USDOE, Washington, DC (United States). (CONF-930159–58: OE/LASE '93: International Society for Optical Engineering (SPIE) conference, Los Angeles, CA (United States), 13-23 Jan 1993). Order Number DE94001067. Source: OSTI; NTIS; GPO Dep.

The authors report on the design and fabrication of continuous contour (kinoform) phase plates for homogenizing the focal plane irradiance of high-power, inertial confinement fusion laser systems. These kinoform phase plates are designed using an iterative algorithm. They offer the flexibility of controlling the overall shape of the far-field irradiance profile and the ability to concentrate the energy within a central region of the focal profile. These properties make kinoforms superior to the conventional, binary random phase plates for many applications. Potential methods for fabrication of such kinoform phase plates are discussed.

2789 (UCRL-JC–112742) **Simulations of spectral broadening by cross-phase modulation (XPM) with chaotic light pulses.** Henesian, M.A. (Lawrence Livermore National Lab., CA (United States)); Dixit, S.N.; Chen, C.J.; Wai, P.K.A.; Menyuk, C.R. Lawrence Livermore National Lab., CA (United States). 25 May 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930159–55: OE/LASE '93: International Society for Optical Engineering (SPIE) conference, Los Angeles, CA (United States), 13-23 Jan 1993). Order Number DE93019623. Source: OSTI; NTIS; GPO Dep.

Spectral broadening of single-frequency laser pulses by optical cross-phase modulation (XPM) with chaotic laser pulses in birefringent single-mode optical fibers is investigated numerically and results are compared with experiments. By this process we have generated laser pulses of variable bandwidth (1–25 Å) at the fundamental wavelength (1053 nm) for amplification in high power solid-state Nd:glass lasers used for inertial confinement fusion research. Simulations indicate that a temporally smooth XPM pulse can be generated with intensity fluctuations of less than 10% and spectral width greater than 50 Å using a short length (~5 m) of special low dispersion and low birefringence fiber, e.g. D = 10 ps/nm-km (normal dispersion) and $\Delta n = 2 \times 10^{-5}$. Readily available fibers of similar length, with parameters of D = 40 ps/nm-km and $\Delta n = 6 \times 10^{-5}$, can give spectral widths exceeding 25 Å, but the noise will range from 25 to 60%. Broadband laser pulses generated by XPM are now routinely used at Lawrence Livermore National Laboratory for active smoothing of the laser irradiance on targets by the technique of smoothing-by-spectral dispersion.

2790 (UCRL-JC–112765) **Structural analysis of a superconducting central solenoid for the Tokamak Physics Experiment.** O'Connor, T.G.; Heim, J.R. Lawrence Livermore National Lab., CA (United States). 15 Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930926–17: 13. international conference on

magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001536. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment (TPX) concept design uses superconducting coils to accomplish magnetic confinement. The central solenoid (CS) magnet is divided vertically into 8 equal segments which are powered independently. The eddy current heating from the pulsed operation is too high for a case type construction; therefore, a "no case" design has been chosen. This "no case" design uses the conductor conduit as the primary structure and the electrical insulation as a structural adhesive. This electrical insulation is the "weak link" in the coil winding pack structure and needs to be modeled in detail. A global finite element model with smeared winding pack properties was used to study the CS magnet structural behavior. The structural analysis results and peak stresses will be presented.

2791 (UCRL-JC–113091) **Neutron detector for fusion reaction-rate measurements.** Lerche, R.A.; Phillion, D.W.; Tietbohl, G.L. Lawrence Livermore National Lab., CA (United States). 3 Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–37: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE93040540. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a fast, sensitive neutron detector for recording the fusion reaction-rate history of inertial-confinement fusion (ICF) experiments. The detector is based on the fast rise-time of a commercial plastic scintillator (BC-422) and has a response < 25-ps FWHM. A thin piece of scintillator material acts as a neutron-to-light converter. A zoom lens images light from the scintillator surface to a high-speed (15 ps) optical streak camera for recording. The zoom lens allows the scintillator to be positioned between 1 and 50 cm from a target. The camera simulaneously records an optical fiducial pulse which allows the camera time base to be calibrated relative to the incident laser power. Bursts of x rays formed by focusing 20-ps, 2.5-TW laser pulses onto gold disk targets demonstrate the detector resolution to be < 25 ps. We have recorded burn histories for deuterium/tritium-filled targets producing as few as 3×10^7 neutrons.

2792 (UCRL-JC–113505) **Parametric instabilities in picosecond time scales.** Baldis, H.A. (Lawrence Livermore National Lab., CA (United States)); Rozmus, W.; Labaune, C.; Mounaix, Ph.; Pesme, D.; Baton, S.; Tikhonchuk, V.T. Lawrence Livermore National Lab., CA (United States). 1 Mar 1993. 40p. Sponsored by USDOE, Washington, DC (United States); Natural Sciences and Engineering Research Council of Canada, Ottawa, ON (Canada). DOE Contract W-7405-ENG-48. (CONF-9208188–3: North Atlantic Treaty Organization/Advanced Studies Institute (NATO/ASI) summer school: from statistical physics to statistical inference and back, Cargese (France), 31 Aug - 12 sep 1992). Order Number DE94000384. Source: OSTI; NTIS; GPO Dep.

The coupling of intense laser light with plasmas is a rich field of plasma physics, with many applications. Among these are inertial confinement fusion (ICF), x-ray lasers, particle acceleration, and x-ray sources. Parametric instabilities have been studied for many years because of their importance to ICF; with laser pulses with duration of approximately a nanosecond, and laser intensities in the range 10^{14}–10^{15}W/cm^2 these instabilities are of crucial concern because of a number of detrimental effects. Although the laser pulse duration of interest for these studies are relatively long, it has been evident in the past years that to reach an understanding of these instabilities requires their characterization and analysis in picosecond time scales. At the laser intensities of interest, the growth rate for stimulated Brillouin scattering (SBS) is of the order of picoseconds, and of an order of magnitude shorter for stimulated Raman scattering (SRS). In this paper the authors discuss SBS and SRS in the context of their evolution in picosecond time scales. They describe the fundamental concepts associated with their growth and saturation, and recent work on the nonlinear treatment required for the modeling of these instabilities at high laser intensities.

2793 (UCRL-JC–114043) **A lower cost development path for heavy ion fusion.** Hogan, W.J. (Lawrence Livermore National Lab., CA (United States)); Meier, W.R. Lawrence Livermore National Lab., CA (United States). 19 May 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305136–15: International symposium on heavy ion fusion, Frascati (Italy), 25-28 May 1993). Order Number DE94001062. Source: OSTI; NTIS; INIS; GPO Dep.

If two features of the inertial fusion process are exploited successfully, they can lead to significantly lower costs for demonstrating the feasibility of commercial electric power production from this source of energy. First, fusion capsule ignition and burn physics is independent of reaction chamber size and hydrodynamically-equivalent capsules can be designed to perform at small yield, exactly as they do at large yield. This means that an integrated test of all power plant components and feasibility tests of various reaction chamber concepts can be done at much smaller sizes (about 1–2 m first wall radius) and much lower powers (tens of MWs) than magnetic fusion development facilities such as ITER. Second, the driver, which is the most expensive component of currently conceived IFE development facilities, can be used to support more than one experiment target chamber/reactor (simultaneously and/or sequentially). These two factors lead to lower development facility costs, modular facilities, and the planning flexibility to spread costs over time or do several things in parallel and thus shorten the total time needed for development of Inertial Fusion Energy (IFE). In this paper the authors describe the general feature of a heavy ion fusion development plan that takes advantage of upgradable accelerators and the ability to test chambers and reactor systems at small scale in order to reduce development time and costs.

2794 (UCRL-JC–114185) **Calculated cross sections for production and destruction of some long-lived nuclides of importance in fusion energy applications.** Gardner, M.A.; Gardner, D.G. Lawrence Livermore National Lab., CA (United States). 8 Jul 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9304181–2: IAEA's coordinated research on activation cross sections for the generation of long-lived and radionuclides of importance in fusion reactor technology, San Diego, CA (United States), 29-30 Apr 1993). Order Number DE94001515. Source: OSTI; NTIS; INIS; GPO Dep.

Knowledge of the production and destruction of long-lived species via neutrons, photons, and charged-particles is required in many fusion energy applications, such as reactor first-wall and blanket design, radioactive waste management, etc. Here we describe our calculational results for the production, via the (n,2n) reaction, of the following long-lived species: ^{150}Eu($t_{1/2}$ = 36 y), ^{152}Eu($t_{1/2}$ = 13 y), and ^{192m2}Ir($t_{1/2}$ = 241 y). Some comments on calculations that we've made for destruction reactions of these species are also included.

2795 (UCRL-JC–114238) **Mean time between failures (MTBF) and availability of the Gyrotron system used on the Microwave Tokamak Experiment at Lawrence Livermore National Laboratory.** Ferguson, S.W.; Jackson, M.C.; Seilhymer, D.B. Lawrence Livermore National Lab., CA (United States). 3 Sep 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931018–23: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94002008. Source: OSTI; NTIS; GPO Dep.

This paper presents an analysis of the mean time between failures (MTBF) and availability history of the Varian VGT8140, 400 Watt, 140 GHz Gyrotron that was operated on the Microwave Tokamak Experiment (MTX) at the Lawrence Livermore National Laboratory (LLNL).

2796 (UCRL-JC–114679) **Superconducting magnet system for the TPX Tokamak.** Hassenzahl, W.V. (and others); Chaplin, M.R.; Heim, J.R. Lawrence Livermore National Lab., CA (United States). 15 Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930926–15: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94001535. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment (TPX) will be the first Tokamak using superconducting magnets for both the poloidal and toroidal field. It is designed for advanced Tokamak physics experiments in steady-state and long-pulse operation. The TPX

superconducting magnets use an advanced cable-in-conduit conductor (CICC) design similar to that developed in support of the International Thermonuclear Experimental Reactor (ITER). The toroidal field magnets provide 4.0 T at 2.25 m with a stored energy of 1.05 GJ. The poloidal field magnets provide 18.0 V-s to ohmically start and control long burns of a 2.0 MA plasma.

2797 (UCRL-LR–105821-93-3) **Inertial Confinement Fusion Quarterly Report: April–June 1993, Volume 3, Number 3.** MacGowan, B.J. (ed.). Lawrence Livermore National Lab., CA (United States). 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94002602. Source: OSTI; NTIS; GPO Dep.

This issue of the ICF Quarterly contains six articles describing recent advances in Lawrence Livermore National Laboratory's inertial confinement fusion (ICF) program. The current emphasis of the ICF program is in support of DOE's National Ignition Facility (NIF) initiative for demonstrating ignition and gain with a 1-2 MJ glass laser. The articles describe recent Nova experiments and investigations tailored towards enhancing understanding of the key physics and technological issues for the NIF. Titles of the articles are: development of large-aperture KDP crystals; inner-shell photo-ionized X-ray lasers; X-ray radiographic measurements of radiation-driven shock and interface motion in solid density materials; the role of nodule defects in laser-induced damage of multilayer optical coatings; techniques of Mbar to near-Gbar equation-of-state measurements with the Nova laser; parametric instabilities and laser-beam smoothing.

2798 (UCRL-LR–114660) **The Mirrortron experiment: A proof of principle test for a method of generating high transient potentials.** Douglass, S.R. Lawrence Livermore National Lab., CA (United States). Sep 1993. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93040534. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Univ. of California, Davis, CA.

The Mirrortron is a concept in which heavy ions are accelerated by a large local transient space potential that is produced in a hot electron plasma. The purpose of this experiment is to begin a proof of principle experiment to investigate the feasibility of producing this space potential and its associated electric field. If a large magnetic field is suddenly generated in a hot electron plasma with a loss-cone distribution, then potentials on the order of the electron temperature are expected. This potential lasts a few tens of nanoseconds. The investigation begins with a theoretical analysis of this phenomenon giving the space potential as a function of the applied magnetic field. The theory is further extended to cases of relativistic electron distributions. This is then followed by design work on a mirror confinement system for hot electrons. In this experiment a 50–100 keV electron temperature plasma is created with electron cyclotron resonance heating using two frequencies of relatively low microwave power. The microwaves are coupled to resonant frequencies of the vacuum chamber. The volume averaged plasma density is measured to be in the 10^9 cm^{-3} range. A strap coil and a flat Blumlein transmission line pulse generator were developed to produce a 150 gauss field within 70 ns. The strap coil was placed at the midplane of the mirror field, where the field is 700 gauss. Based on theoretical estimates and computer simulations a 20 kV potential is expected. Measurement of this potential is derived from the modulation of the current of a monoenergetic electron beam after it passes through the high potential region. The variation in the beam energy allows bunching to occur in transit to the detector.

99 GENERAL AND MISCELLANEOUS

2799 (DOE/IG–0332) **Inspection of the Department of Energy's procedures for administering contractors' executive employees' compensation.** USDOE Office of Inspector General, Washington, DC (United States). Office of Inspections. 10 Aug 1993. 58p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

Report to The Secretary.

An inspection was conducted of certain aspects of the Department of Energy's administration of its management and operating and other designated contractors' executive employees' compensation. The purpose of the inspection was to evaluate whether Departmental officials were performing their responsibilities for reviewing, approving and reporting contractors' executive employees' compensation. Contractor executive employees' compensation totalled $533 million in fiscal year 1991. Results are described.

9901 Management

Refer also to citation(s) 273, 399, 489, 776, 870, 1982, 1983

2800 (BUP–1992-03) **Progress report of BONTT - 1991.** Csernai, L.P. (ed.). Bergen Univ. (Norway). Dept. of Physics. Apr 1992. 34p. Order Number DE94606281. Source: OSTI; NTIS; INIS.

The research reported aims at the theoretical investigation of exotic nuclear phenomena: Exotic scenarios of high energy heavy ion reactions in a wide energy range, primarily above the energies of classical nuclear physics, as well as exotic states of nuclei far off the stability line explored as radioactive beams of low and intermediate energy. The report includes the US NSF - NAVF collaboration agreement in nuclear theory, the Hung. Acad. of Sci. - NAVF collaboration agreement in nuclear theory, as well as the theoretical studies related to the CERN heavy ion programme.

2801 (DOE/BP–2211) **Bonneville purchasing instructions, Post-award guide for service contracts: Appendix 14A: Contracting Officer's Technical Representatives' guide for services contracts.** USDOE Bonneville Power Administration, Portland, OR (United States). Jul 1993. 48p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000944. Source: OSTI; NTIS; GPO Dep.

This guide outlines the duties of BPA personnel designated as Contracting Officers Technical Representatives (COTRs). The BPA Administrator gives contracting officers (COs) in BPA responsibility and authority for awarding and administering contracts. COs are authorized to designate other BPA employees to act as their representatives for purposes of contract administration, from the time of contract award until final receipt and acceptance of the contracted services. COTRs are the individuals primarily relied upon to perform technical contract administration functions. Similar functions for supply and construction contracts are performed by engineering representatives, construction inspectors, and inspectors. Although this Guide is written primarily with the COTR in mind, the concept and operation of teamwork is essential throughout the entire process of contract administration. The CO administers the contract during performance, but rarely has expertise in all of the relevant technical areas. Therefore, CO decisions rely on input from a team. The COTR is an indispensable member of that team. The instructions in this Guide are designed to facilitate this essential CO-COTR cooperation. COTR duties are usually additional to those required of the COTR in his or her assigned line organization. The COTR is still accountable to the line supervisor for performance of regularly-assigned duties. These duties are to be reflected appropriately in performance appraisals and job descriptions. For contract administration duties, however, the COTR reports directly to, and is accountable only to, the CO. The COTR's supervisor must allow sufficient time to ensure that the COTR can adequately monitor the contract for technical compliance. This Guide is designed for COTRs who are performing service contract (including intergovernmental contract) administration functions as an adjunct to their normal technical duties.

2802 (DOE/EM–0105P) **Divison of Environmental Education and Development Fiscal Year 1992 annual report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). [1992]. 35p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94001561. Source: OSTI; NTIS; GPO Dep.

Primary design criterion for this division's education activities is directly related to meeting the goal of environmental compliance on an accelerated basis and cleanup of the 1989 inventory of inactive sites and facilities by the year 2019. Therefore, the division's efforts are directed toward stimulating knowledge and capability to achieve

the goals while contributing to DOE's overall goal of increasing scientific, mathematical, and technical literacy and competency. This annual report is divided into: overview, workforce development, academic partnerships, scholarships/fellowships, environmental restoration and waste management employment program, community colleges, outreach, evaluation, and principal DOE contacts.

2803 (DOE/ER–0604P) **A report of the Basic Energy Sciences Advisory Committee: 1992 review of the Basic Energy Sciences Program of the Department of Energy.** USDOE Office of Energy Research, Washington, DC (United States). Sep 1993. 69p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94002498. Source: OSTI; NTIS; INIS; GPO Dep.

The general quality of BES research at each of the 4 laboratories is high. Diversity of management at the different laboratories is beneficial as long as the primary BES mission and goals are clearly identified and effectively pursued. External sources of personnel should be encouraged. DOE has been designing a new high flux research reactor, the Advanced Neutron Source, to replace DOE's two aging research reactors; BESAC conducted a panel evaluation of neutron sources for the future. The two new light sources, Advanced Light Source and Advanced Photon source will come on line well before all of their beamline instrumentation can be funded, developed, and installed. Appointment of a permanent director and deputy for OBES would enhance OBES effectiveness in budget planning and intra-DOE program coordination. Some DOE and DP laboratories have substantial infrastructure which match well industry development-applications needs; interlaboratory partnerships in this area are encouraged. Funding for basic science research programs should be maintained at FY1993 levels, adjusted for inflation; OBES plans should be updated and monitored to maintain the balance between basic research and facilities construction and operation. The recommendations are discussed in detail in this document.

2804 (DOE/ER/75660–2) **Mississippi graduate trainee project for DOE EPSCoR: Summary report for year No. 2.** Wertz, D.L. University of Southern Mississippi, Hattiesburg, MS (United States). Oct 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER75660. Order Number DE94001643. Source: OSTI; NTIS; GPO Dep.

Three research clusters were selected for emphasis in the Mississippi DOE EPSCoR project: Fossil fuel pollutants, enhanced oil recovery, and power systems and conservation. Brief progress reports are given.

2805 (DOE-TSL–1-93-Rev.1) **Department of Energy standards index: Revision 1.** USDOE, Washington, DC (United States). Sep 1993. 82p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000425. Source: OSTI; NTIS; GPO Dep.

This document was prepared for personnel involved in selection and use of DOE technical standards and other standardization documents. The document provides listings of DOE technical standards, non-Government standards adopted by DOE, other Government documents in which DOE has a recorded interest, and DOE site standards. Cancelled DOE technical standards are also listed.

2806 (INIS-GB–501) **Radiological protection 1993 post-graduate course: 22 Feb -19 March and 10 May - 4 June.** National Radiological Protection Board, Chilton (United Kingdom). 1993. 6p. Order Number DE94604703. Source: OSTI; NTIS (US Sales Only); INIS.

This pamphlet describes a post-graduate course organized by the NRPB and intended to meet the initial and early training requirements of full-time staff of graduate level or equivalent involved in radiological protection including health physics. The course contains sixty-five lectures covering topics such as nuclear physics, sources and uses of radiation, instrumentation, radiation biology, system of protection, occupational protection, dosimetry, population protection, legal, medical and administrative aspects and general hazards. The 1994 courses are being held from 28th February - 25th March and 18th April -13th May, 1993. (UK).

2807 (INIS-GB–502) **Advanced radiological protection course 1993: 15 November - 3 December.** National Radiological Protection Board, Chilton (United Kingdom). 1993. 3p. Order Number DE94604704. Source: OSTI; NTIS (US Sales Only); INIS.

This pamphlet describes an advanced radiological protection course organised by the NRPB and aimed at experienced health physicists and others who have worked in radiological protection for some years. A knowledge of basic radiological protection is assumed. The course concentrates on developing awareness of the policies and philosophy upon which radiological protection is based. Emphasis is given to managerial and professional responsibilities in radiological protection and to involvement with problems of industrial and public relations. The 1994 course is 3 - 21st October. (Author).

2808 (INIS-GB–504) **AEA Technology, Harwell site emergency plan.** British Medical Association, London (United Kingdom). 1993. 40p. Order Number DE94604705. Source: OSTI; NTIS (US Sales Only); INIS.

Includes 2 NRPB At-A-Glance Series information sheets on radiation protection and nuclear emergencies and an AEA Leaflet for Public Information on emergency arrangements.

This plan, describes the site arrangements and facilities for dealing with an emergency at Harwell. These arrangements consist of amongst other things provision of suitably qualified, experienced and trained staff to take up posts, provision of suitable facilities and equipment, arrangements to alert and protect persons on and off the site, liaison and contact arrangements with external agencies and organisations and supply of information before and during any emergency. Other organisations have their own arrangements for dealing with an emergency at AEA Technology Harwell. The arrangements for dealing with any off-site consequences are drawn together in the "Oxfordshire County Council Essential Services Emergency Plan (Off-Site) for AEA Technology, Harwell". Prior information for members of the public who may be affected in the event of an emergency at Harwell is issued in the form of leaflets. (author).

2809 (INIS-GB–506) **Annual report and accounts 1992-93.** Scottish Nuclear Ltd., Glasgow (United Kingdom). Jul 1993. 52p. Order Number DE94606282. Source: OSTI; NTIS (US Sales Only); INIS.

Scottish Nuclear Limited is Scotland's nuclear power generating company. The Annual Report and Accounts for 1992-1993 are presented. The Company is owned by the Secretary of State for Scotland and supplies all its electricity to Scottish Power (74.9%) and Scottish Hydro-Electric (25.1%). It produces almost half of Scotland's electricity requirements. The Company owns and operates the Advanced Gas-Cooled Reactor (AGR) nuclear power stations at Hunterston on the Firth of Clyde and at Torness on the East Coast of Scotland. It is also responsible for the decommissioning of the magnox nuclear power station, Hunterston A. (Author).

2810 (INIS-mf–13711) **International Atomic Energy Agency. Highlights of activities. September 1993.** Gillen, V.A. (ed.). International Atomic Energy Agency, Vienna (Austria). Sep 1993. 67p. (IAEA/PI–A22E.). Order Number DE94604706. Source: OSTI; NTIS (US Sales Only); INIS.

This document describes the most important activities of the International Atomic Energy Agency during the period September 1992 - September 1993, in particular in the following areas: (i) nuclear power; (ii) nuclear fuel cycle; (iii) radioactive waste management; (iv) comparative assessment of energy sources; (v) IAEA laboratory activities; (vi) nuclear applications in the food industry and in agriculture; (vii) human health applications of nuclear techniques, especially in the treatment and prevention of diseases and in the analysis of health problems related to the environment; (viii) industry and earth sciences; (ix) physical and chemical sciences; (x) radiation protection; (xi) safety of nuclear installations; (xii) safeguards and non-proliferation activities; (xiii) activities in the area of public and technical information such as the International Nuclear Information System (INIS) and other IAEA computerized databases and reference systems, the publication Nuclear Fusion, a monthly scientific journal of articles on thermonuclear fusion research and development, and the organization of meetings on atomic energy;

and (xiv) a description of the Agency's technical assistance activities, including financial data.

2811 (INIS-mf–13715) **The annual report for 1992.** International Atomic Energy Agency, Vienna (Austria). Jul 1993. 201p. (GC–37/1060.). Order Number DE94606283. Source: OSTI; NTIS (US Sales Only); INIS.

The most significant achievements of the International Atomic Energy Agency during 1992 are summarized in the Introduction. The following topics are considered in detail: (i) nuclear power; (ii) nuclear fuel cycle; (iii) radioactive waste management; (iv) comparative assessment of nuclear power and other energy sources; (v) food and agriculture; (vi) human health; (vii) industry and earth science; (viii) physical and chemical sciences; (ix) radiation protection; (x) safety of nuclear installations; and (xi) safeguards. The annual report ends with a description of the direction and support, statistical appendices, a list of abbreviations, and an organization chart.

2812 (INIS-mf–13716) **The Agency's technical co-operation activities in 1992: Report by the Director General.** International Atomic Energy Agency, Vienna (Austria). Aug 1993. 254p. (GC–37/INF/317.). Order Number DE94604707. Source: OSTI; NTIS (US Sales Only); INIS.

This report on the International Atomic Energy Agency's Technical Co-operation Activities in 1992 contains an overview of the general issues involved, including both in-house and external developments, resources and delivery, and evaluation of programs; an overview by field of activity and by division within the Agency; an overview by geographic area, distinguishing (i) Africa, (ii) Asia and the Pacific, (iii) Latin America, (iv) and the Middle East and Europe; an overview by component (i.e., experts, equipment, fellowships, training courses, sub-contracts and miscellaneous); and an overview by fund technical assistance and co-operation fund, extrabudgetary resources, United Nations Development Program (UNDP), assistance in kind. It also contains a profile on technical co-operation activities in Latin America. Projects concluded during 1992 are listed together with a description of their achievements. It concludes with implementation summaries. 10 figs, 9 tabs.

2813 (JINR–92-169) **What is science?: Some problems in financing science in small and not rich countries.** Kiss, D. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 13p. Order Number DE94606284. Source: OSTI; NTIS (US Sales Only); INIS.

Some characteristic features of real science (i.e. fundamental or basic research), as compared to activity aimed at applied research and technical development are defined. The condusion if these activitites can corrupt fundamental science, especially in small and not rich countries. Basic research has no definite 'end-product'; its end-product is new knowledge. It is not a sin but the duty of a basic researcher to 'play'. The wonderful results to technical civiliozation were born as a result of this 'play', i.e. basic research. Modern industry spends yearly about the value of its daily production on scientific research. No small country can subsist if all its scientific information and knowledge are imported.

2814 (OUP–93-14) **1992 Progress report by the Bergen-Oslo Nuclear Theory Team (BONTT).** Csernai, L.P. (ed.). Oslo Univ. (Norway). Fysisk Inst. Jun 1993. 22p. Order Number DE94606285. Source: OSTI; NTIS; INIS.

The research reported aims at the theoretical investigation of exotic nuclear phenomena: Exotic scenarios of high energy heavy ion reactions in a wide energy range, primarily above the energies of classical nuciear physics, as well as exotic states of nuclei far off the stability line explored as radioactive beams of low and intermediate energy. The report includes the US NSF - NAVF collaboration agreement in nuclear theory (funding stopped for 1993), the Hung. Acad. of Sci. - NAVF collaboration agreement in nuclear theory, as well as the theoretical studies related to the CERN heavy ion programme.

2815 (PNL–8815) **Software Configuration Management Plan (SCMP) version 1.1, Phase 1: Federal Emergency Management Information System (FEMIS): System platform.** Strycker, F.E. Jr. Pacific Northwest Lab., Richland, WA (United States). 19 Jul 1993. 39p. Sponsored by Federal Emergency Management Agency, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE93040918. Source: OSTI; NTIS; GPO Dep.

This document is the Software Configuration Management Plan (SCMP) for the Federal Emergency Management Information System (FEMIS) project. FEMIS is an automated decision support system that integrates the planning and analysis, operations and response, and recovery phases of emergency management. It has broad application across the full range of emergency planning and operations. The SCMP will describe the configuration management system to be used for the control and maintenance of the software and associated documentation during development, test, and production of the FEMIS project. This plan provides information on the requirements and procedures necessary for the configuration management activities of FEMIS. It identifies the software configuration management requirements and establishes the methodology for generating configuration identifiers, controlling engineering changes, maintaining status accounting, and performing audits and reviews during the design and development of software configuration items. This plan defines the Software Configuration Management (SCM) activities necessary for maintaining all support software items and associated documentation being developed, procured, tested, sustained and kept in the production environment for FEMIS. It will apply to all phases of the software development life cycle, up to and including the time of delivery to the customer.

2816 (SAND–93-1945C) **Quality and small business competitiveness: Where are we and what needs to happen?.** Loveland, J. (New Mexico State Univ., Las Cruces, NM (United States)); Whatley, A.; Tapp, C. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9310155–1: Mountain Plains management conference, Cedar, UT (United States), 7-9 Oct 1993). Order Number DE93040047. Source: OSTI; NTIS; GPO Dep.

Quality management is more than an idea whose time has come, more than a passing fancy. Quality will be an imperative for competitiveness in the 21st century. Many large US firms have already implemented or are considering implementing total quarry management practices and processes. While most of the current literature on quality management focuses on large firms, quality management is arguably even more relevant to small businesses. As global markets become increasingly a reality in today's world, small business managers and owners must focus on customer, satisfaction and continuous improvement if they are to survive the global competitive battle. Quality management may not be a luxury but rather, an essential focus for successful small business oompetitiveness. This paper examines quality management practices, awareness level, needs, and successes for small businesses in the Rocky Mountain region of the United States. This region is especially dependent upon small business competitiveness for economic survival and growth. A significant percent of total employment and sales in this region of the US is attributable to businesses classified as small. The specific purposes of the paper are: to report the results of a survey of small manufacturers' use, success, awareness, and interest in quality management practices and programs; to provide a profile of those manufacturers who have implemented quality management programs; and to describe a unique partnership between a state university and a large national lab designed to assist small business owners and managers in evaluating and implementing total quality management techniques.

2817 (SAND–93-2292C) **Combined business and quality plan based on Malcolm Baldrige.** Johnson, R.T. Jr. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9310183–1: Measurement quality conference, Gaithersburg, MD (United States), 26-27 Oct 1993). Order Number DE94001200. Source: OSTI; NTIS; GPO Dep.

This paper describes an approach to developing a business plan which also serves as a quality plan and quality manual. It is organized following the major categories of the Malcolm Baldrige

National Quality Award. It has been applied to the Measurement Standards Program Operations at Sandia National Laboratories.

2818 (UTNL-R–0298) **Annual report of Nuclear Engineering Research Laboratory, University of Tokyo in fiscal 1992.** Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. Jul 1993. 78p. (In Japanese). Order Number DE94719026. Source: OSTI; NTIS; INIS.

In this annual report, the activities of education and research, the state of operation of research facilities and others in Nuclear Engineering Research Laboratory, University of Tokyo in fiscal year 1992 are summarized. In this Laboratory, there are four large research facilities, that are, the fast neutron source reactor 'Yayoi', the electron beam linac, the nuclear fusion reactor blanket experiment facility and the heavy irradiation research facility. Those are used for carrying out education and research in the wide fields of nuclear engineering, and are offered also for joint utilization. The results of research by using respective research facilities have been summarized in separate reports. The course of the management and operation of each research facility is described, and the research activities, the theses for doctorate and graduation these of teachers, personnel and graduate students in the Laboratory are summarized. (J.P.N.).

2819 (UTNL-R–0300) **Report of the research results with University of Tokyo, Nuclear Engineering Research laboratory's Facilities in fiscal 1992.** Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. 155p. (In Japanese). Order Number DE94719025. Source: OSTI; NTIS; INIS.

This publication summarizes the results of the joint utilization of the research 'Yayoi' and the electron beam accelerator in the Nuclear Engineering Research Laboratory, University of Tokyo, in the fiscal year 1992. The Yayoi was operated smoothly through the year, and the number of research themes, for which the reactor Yayoi was jointly utilized and the related themes reached 23 cases. The research themes of the linac count up to 17, after its reconstruction to be twin-linac. In this publication, in addition to the utilization reports, also the 16 reports of Yayoi Study Meetings held in fiscal year 1992 are collected. (J.P.N.).

2820 (VTT-EKA-B–9) **Nuclear energy related research: Research Programme Plan 1992.** Rintamaa, R. (ed.). Technical Research Centre of Finland, Espoo (Finland). May 1992. 55p. Order Number DE94606286. Source: OSTI; NTIS; INIS.

The annual Research Programme Plan describes publicly funded nuclear energy related research to be carried out mainly at the Technical Research Centre of Finland (VTT) in 1992. The research is financed primarily by the Ministry of Trade and Industry (KTM), the Finnish Centre for Radiation and Nuclear Safety (STUK) and VTT itself. Other research institutes, utilities and industry also contribute to many projects.

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Refer also to citation(s) 78, 79, 208, 221, 277, 313, 340, 445, 477, 677, 691, 693, 709, 711, 715, 721, 722, 742, 748, 750, 753, 778, 797, 798, 803, 815, 847, 951, 979, 984, 1371, 1375, 1376, 1386, 1389, 1391, 1393, 1394, 1403, 1427, 1440, 1441, 1454, 1469, 1477, 1491, 1516, 1538, 1555, 1558, 1694, 1768, 1780, 1794, 1826, 1832, 1834, 1835, 1838, 1842, 1848, 1855, 1872, 1880, 1881, 1882, 1883, 1893, 1895, 1943, 1946, 1954, 1955, 2136, 2137, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2151, 2152, 2176, 2187, 2261, 2276, 2281, 2294, 2303, 2316, 2317, 2321, 2323, 2324, 2326, 2346, 2347, 2412, 2509, 2526, 2563, 2583, 2601, 2608, 2717, 2750, 2754, 2885, 2886, 2888, 2889

2821 (AAA-KTF/IVT–92/11) **A neural network for non linear principal component analysis.** Bjoerkholm, T.; Hermanson, A.; Rothberg, A. Abo Akademi, Turku (Finland). Heat Engineering Lab. 1992. 21p. Order Number DE94709669. Source: OSTI; NTIS.

Non linear principal component analysis (NLPCA) is a method of reducing the number of variables needed to describe a system without loosing information. It offers great advantages for data logging in scientific experiments and in industry. NLPCA can be implemented as a neural network with five or more layers. The problem with neural network implementations of NLPCA has been that the training of a five layer network is very hard. In order to get any training result at all, a dominant path initialisation method was used. The method is demonstrated in two case studies. The first case is thermodynamical data for vapour. The training data contain no stochastic errors and the number of principal components is known. The second case is measurement data from an industrial blast furnace process. Data contain noise and the number of principal components is unknown. In addition to the obvious advantage of reducing the data storage volume, NLPCA of offers an even greater advantage in the possibility to detect abnormal measurements.

2822 (ANL–93/23) **Users manual for the Chameleon parallel programming tools.** Gropp, W. (Argonne National Lab., IL (United States)); Smith, B. Argonne National Lab., IL (United States); Office of Naval Research, Washington, DC (United States). Jun 1993. 71p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract N00014-90-J-1695. Order Number DE94001934. Source: OSTI; NTIS; GPO Dep.

Message passing is a common method for writing programs for distributed-memory parallel computers. Unfortunately, the lack of a standard for message passing has hampered the construction of portable and efficient parallel programs. In an attempt to remedy this problem, a number of groups have developed their own message-passing systems, each with its own strengths and weaknesses. Chameleon is a second-generation system of this type. Rather than replacing these existing systems, Chameleon is meant to supplement them by providing a uniform way to access many of these systems. Chameleon's goals are to (a) be very lightweight (low over-head), (b) be highly portable, and (c) help standardize program startup and the use of emerging message-passing operations such as collective operations on subsets of processors. Chameleon also provides a way to port programs written using PICL or Intel NX message passing to other systems, including collections of workstations. Chameleon is tracking the Message-Passing Interface (MPI) draft standard and will provide both an MPI implementation and an MPI transport layer. Chameleon provides support for heterogeneous computing by using p4 and PVM. Chameleon's support for homogeneous computing includes the portable libraries p4, PICL, and PVM and vendor-specific implementation for Intel NX, IBM EUI (SP-1), and Thinking Machines CMMD (CM-5). Support for Ncube and PVM 3.x is also under development.

2823 (ANL–93/26) **Programming in Fortran M.** Foster, I.; Olson, R.; Tuecke, S. Argonne National Lab., IL (United States). Aug 1993. 53p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract CCR-8809615. Order Number DE94000541. Source: OSTI; NTIS; GPO Dep.

Fortran M is a small set of extensions to Fortran that supports a modular approach to the construction of sequential and parallel programs. Fortran M programs use channels to plug together processes which may be written in Fortran M or Fortran 77. Processes communicate by sending and receiving messages on channels. Channels and processes can be created dynamically, but programs remain deterministic unless specialized nondeterministic constructs are used. Fortran M programs can execute on a range of sequential, parallel, and networked computers. This report incorporates both a tutorial introduction to Fortran M and a users guide for the Fortran M compiler developed at Argonne National Laboratory. The Fortran M compiler, supporting software, and documentation are made available free of charge by Argonne National Laboratory, but are protected by a copyright which places certain restrictions on how they may be redistributed. See the software for details. The latest version of both the compiler and this manual can be obtained by anonymous ftp from Argonne National Laboratory in the directory pub/fortran-m at info.mcs.anl.gov.

2824 (ANL–93/28) **Fortran M language definition.** Foster, I.T.; Chandy, K.M. Argonne National Lab., IL (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract CCR-8809615. Order Number DE94001577. Source: OSTI; NTIS; GPO Dep.

This document defines the Fortran M extensions to Fortran 77. It updates an earlier definition, dated June 1992, in several minor respects.

2825 (ANL/EAIS–9) **Resource Allocation Support System (RASS): Summary report of the 1992 pilot study.** Buehring, W.A.; Whitfield, R.G.; Wolsko, T.D.; Kier, P.H.; Absil, M.J.G.; Jusko, M.J.; Sapinski, P.F. Argonne National Lab., IL (United States). Environmental Assessment and Information Sciences Div. Feb 1993. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93040169. Source: OSTI; INIS; NTIS; GPO Dep.

The Resource Allocation Support System (RASS) is a decision-aiding system being developed to assist the US Department of Energy's (DOE's) Office of Waste Management in program and budget decision making. Four pilot studies were conducted at DOE field offices in summer 1992 to evaluate and improve the RASS design. This report summarizes the combined results of the individual field office pilot studies. Results are presented from different perspectives to illustrate the type of information that would be available from RASS. Lessons learned and directions for future RASS developments are also presented.

2826 (ANL/MCS-TM–179) **Asymptotic analysis, Working Note No. 1: Basic concepts and definitions.** Garbey, M. (Universite Claude Bernard Lyon 1, 69 - Villeurbanne (France). Lab. d'Analyse Numerique); Kaper, H.G. Argonne National Lab., IL (United States). Jul 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94001000. Source: OSTI; NTIS; GPO Dep.

In this note we introduce the basic concepts of asymptotic analysis. After some comments of historical interest we begin by defining the order relations O, o, and $O^{\#}$, which enable us to compare the asymptotic behavior of functions of a small positive parameter ϵ as $\epsilon \downarrow 0$. Next, we introduce order functions, asymptotic sequences of order functions and more general gauge sets of order functions and define the concepts of an asymptotic approximation and an asymptotic expansion with respect to a given gauge set. This string of definitions culminates in the introduction of the concept of a regular asymptotic expansion, also known as a Poincare expansion, of a function $f : (0, \epsilon_0) \to X$, where X is a normed vector space of functions defined on a domain $D \epsilon R^N$. We conclude the note with the asymptotic analysis of an initial value problem whose solution is obtained in the form of a regular asymptotic expansion.

2827 (ANL/MCS-TM–180) **Asymptotic analysis: Working Note No. 2, Approximation of integrals.** Garbey, M. (Lyon-1 Univ., 69 - Villeurbanne (France). Lab. d'Analyse Numerique); Kaper, H.G. Argonne National Lab., IL (United States). Jul 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94000433. Source: OSTI; NTIS; GPO Dep.

In this note we discuss the approximation of integrals that depend on a parameter. The basic tool is simple, namely, integration by parts. Of course, the power of the tool is evidenced in applications. The applications are many; they include Laplace integrals, generalized Laplace integrals, Fourier integrals, and Stokes' method of stationary phase for generalized Fourier integrals. These results illustrate beautifully Hardy's concept of applications of mathematics, that is, "certain regions of mathematical theory in which the notation and the ideas of the (method of integration by parts] may be used systematically with a great gain in clearness and simplicity". The notation differs slightly from Working Note No. 1, for reasons that are mainly historical. The asymptotic analysis of integrals originated in complex analysis, where the (real or complex) parameter, usually denoted by x, is usually introduced in such a way that the interesting behavior of the integrals occurs when $x \to \infty$ in some sector of the complex plane. As there is nothing sacred about notation, and historical precedent is as good a guide as any, we follow convention and denote the parameter by x, focusing on the behavior of integrals as $x \to \infty$ along the real axis or, if x is complex, in some sector of the complex plane. The connection with the notation of Working Note No. 1 is readily established by identifying the small parameter ϵ with $|x|^{-1}$.

2828 (ANL/MCS-TM–181) **Asymptotic analysis: Working note #3, boundary layers.** Garbey, M. (Universite Claude Bernard Lyon 1, Villeurbanne (France). Laboratoire d'Analyse Numerique); Kaper, H.G. Argonne National Lab., IL (United States). Sep 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94002299. Source: OSTI; NTIS; GPO Dep.

In this chapter the authors discuss the asymptotic approximation of functions that display boundary-layer behavior. The purpose here is to introduce the basic concepts underlying the phenomenon, to illustrate its importance, and to describe some of the fundamental tools available for its analysis. To achieve their purpose in the clearest way possible, the authors will work with functions that are assumed to be given explicitly – that is, functions $f : (0,\epsilon_0) \to X$ whose expressions are known, at least in principle. Only in the following chapter will they begin the study of functions that are given implicitly as solutions of boundary value problems – the real stuff of which singular perturbation theory is made. Boundary-layer behavior is associated with asymptotic expansions that are regular "almost everywhere" – that is, expansions that are regular on every compact subset of the domain of definition, but not near the boundary. These regular asymptotic expansions can be continued in a certain sense all the way up to the boundary, but a separate analysis is still necessary in the boundary layer. The boundary-layer analysis is purely local and aims at constructing local approximations in the neighborhood of each point of the singular part of the boundary. The problem of finding an asymptotic approximation is thus reduced to matching the various local approximations to the existing regular expansion valid in the interior of the domain. The authors are thinking, for example, of fluid flow (viscosity), combustion (Lewis number), and superconductivity (Ginzburg-Landau parameter) problems. Their solution may remain smooth over a wide range of parameter values, but as the parameters approach critical values, complicated patterns may emerge.

2829 (BARC–1993/E/009) **A multitransputer parallel processing system (MTPPS).** Jethra, A.K. (Bhabha Atomic Research Centre, Bombay (India). Electronics Div.); Pande, S.S.; Borkar, S.P.; Khare, A.N.; Ghodgaonkar, M.D.; Bairi, B.R. Bhabha Atomic Research Centre, Bombay (India). 1993. 69p. Order Number DE94604652. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the design and implementation of a 16 node Multi Transputer Parallel Processing System(MTPPS) which is a platform for parallel program development. It is a MIMD machine based on message passing paradigm. The basic compute engine is an Inmos Transputer Ims T800-20. Transputer with local memory constitutes the processing element (NODE) of this MIMD architecture. Multiple NODES can be connected to each other in an identifiable network topology through the high speed serial links of the transputer. A Network Configuration Unit (NCU) incorporates the necessary hardware to provide software controlled network configuration. System is modularly expandable and more NODES can be added to the system to achieve the required processing power. The system is backend to the IBM-PC which has been integrated into the system to provide user I/O interface. PC resources are available to the programmer. Interface hardware between the PC and the network of transputers is INMOS compatible. Therefore, all the commercially available development software compatible to INMOS products can run on this system. While giving the details of design and implementation, this report briefly summarises MIMD Architectures, Transputer Architecture and Parallel Processing Software Development issues. LINPACK performance evaluation of the system and solutions of neutron physics and plasma physics problem have been discussed along with results. (author). 12 refs., 22 figs., 3 tabs., 3 appendixes.

2830 (CONF-8804338–1) **Macro-actor execution on multi-level data-driven architectures.** Gaudiot, J.L. (University of Southern California, Los Angeles, CA (United States). Computer Research Inst.); Najjar, W. University of Southern California, Los Angeles, CA (United States). Computer Research Inst. [1988]. 24p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-87ER25043. Contract N00014-86-K-0311. From 1. Italian workshop on parallel architectures and neural networks; Salerno

(Italy); 27-29 Apr 1988. Order Number DE94000318. Source: OSTI; NTIS; GPO Dep.

The data-flow model of computation brings to multiprocessors high programmability at the expense of increased overhead. Applying the model at a higher level leads to better performance but also introduces loss of parallelism. We demonstrate here syntax directed program decomposition methods for the creation of large macro-actors in numerical algorithms. In order to alleviate some of the problems introduced by the lower resolution interpretation, we describe a multi-level of resolution and analyze the requirements for its actual hardware and software integration.

2831 (CONF-880540–4) **Solving Partial Differential Equations in a data-driven multiprocessor environment.** Gaudiot, J.L.; Lin, C.M.; Hosseiniyar, M. University of Southern California, Los Angeles, CA (United States). Computer Research Inst. [1988]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER25043. From 15. annual international symposium on computer architecture; No City Given, HI (United States); 30 May - 2 jun 1988. Order Number DE94000317. Source: OSTI; NTIS; GPO Dep.

Partial differential equations can be found in a host of engineering and scientific problems. The emergence of new parallel architectures has spurred research in the definition of parallel PDE solvers. Concurrently, highly programmable systems such as data-how architectures have been proposed for the exploitation of large scale parallelism. The implementation of some Partial Differential Equation solvers (such as the Jacobi method) on a tagged token data-flow graph is demonstrated here. Asynchronous methods (chaotic relaxation) are studied and new scheduling approaches (the Token No-Labeling scheme) are introduced in order to support the implementation of the asychronous methods in a data-driven environment. New high-level data-flow language program constructs are introduced in order to handle chaotic operations. Finally, the performance of the program graphs is demonstrated by a deterministic simulation of a message passing data-flow multiprocessor. An analysis of the overhead in the data-flow graphs is undertaken to demonstrate the limits of parallel operations in dataflow PDE program graphs.

2832 (CONF-8912178–1) **Performance of asynchronous algorithms in multi-level data-driven systems.** Gaudiot, J.L.; Lin, C.M. University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering Systems. [1989]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER25043. From Conference on decentralized systems; Lyon (France); 11-13 Dec 1989. Order Number DE94000321. Source: OSTI; NTIS; GPO Dep.

Asynchronous algorithms are efficient methods in solving scientific and engineering problems. Much research has been devoted to the study of asynchronous algorithms in different areas. This paper will show asynchronous algorithms applied to logic circuit simulation, communication networks, partial differential equations (PDE) and artificial neural networks, and as well as implementations of these asynchronous algorithms on a special class of multiprocessor systems, namely Multi-level Tagged-token Data-flow (MTD) architectures.

2833 (CONF-900874–5) **A decoupled graph/computation data-driven architecture with variable-resolution actors.** Evripidou, P. (University of Southern California, Marina Del Rey, CA (United States). Information Sciences Inst.); Gaudiot, J.L. University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering. [1990]. 10p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-87ER25043. Contract F30602-88-C-0135. From 1990 international conference on parallel processing; St. Charles, IL (United States); 13-17 Aug 1990. Order Number DE94000324. Source: OSTI; NTIS; GPO Dep.

This paper presents a hybrid multiprocessor architecture that combines the advantages of the dynamic data-flow principles of execution with those of the control-flow model of execution. Two major design ideas are utilized by the proposed model: asynchronous execution of graph and computation operations, and variable- resolution actors. The independence of the two main unites of the machine allows an efficient implementation of functional/data-flow principles with conventional, mature technology. The compiler generates graphs with variable-sized actors in order to match the characteristics of the application to the target machine. For instance, vector actors are proposed for many aspects of scientific computing, while lower resolution (Compound Macro Actors) or conversely higher resolution (atomic instruction actors) is used for unvectorizable programs.

2834 (CONF-900992–3) **A decoupled data-driven architecture with vectors and macro actors.** Evripidou, P. (University of Southern California, Marina Del Rey, CA (United States). Information Sciences Inst.); Gaudiot, J.L. University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering. [1990]. 12p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract FG03-87ER25043. Contract F30602-88-C-0135. From CONPAR '90: international conference on parallel processing; Zurich (Switzerland); 10-13 Sep 1990. Order Number DE94000325. Source: OSTI; NTIS; GPO Dep.

This paper presents the implementation of scientific programs on a decoupled data-driven architecture with vectors and macro actors. This hybrid multiprocessor combines the dynamic data-flow principles of execution with the control-flow of the von Neumann model of execution. The two major ideas utilized by the decoupled model are: Vector and macro actors with variable resolution, and asynchronous execution of graph and computation operations. The compiler generates graphs with various-sized actors in order to match the characteristics of the computation. For instance, vector actors are proposed for many aspects of scientific computing while lower resolution (complier-generated collection of scalar actors) or higher resolution (scalar actors) is used for unvectorizable programs. A block-scheduling technique for extracting more parallelism from sequential constructs is incorporated in the decoupled architecture. In addition a graph-level priority-scheduling mechanism is implemented that improves resource utilization and yields higher performance. A graph unit executes all graph operations and a computation unit executes all computation operations. The independence of the two main units of the machine allows the efficient pipelined execution of macro actors with diverse granularity characteristics.

2835 (CONF-901221–2) **Distributed input/output processing in data-driven multiprocessors.** Evripidou, P. (Southern Methodist Univ., Dallas, TX (United States). Dept. of Computer Science and Engineering); Gaudiot, J.L. University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering Systems. [1992]. 9p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract FG03-87ER25043. Agreement NCC 2-539. From 2. IEEE symposium on parallel and distributed processing; Dallas, TX (United States); 9-13 Dec 1990. Order Number DE94000323. Source: OSTI; NTIS; GPO Dep.

Data-flow principles of execution provide an elegant way to ensure at runtime that instructions can be executed asynchronously in a parallel environment. However, while the conventional von Neumann model of interpretation has a very rigid ordering of instructions, it is the very asynchronous character of the dataflow model of execution that introduces conflicts when "state" tasks (such as I/O operations) must share common data objects. In order to execute I/O operations safely and in parallel, an algorithm to detect and classify cases of potential conflicts (hazards) has been developed; it is described in this paper. It is based upon localizing the effect of I/O operations by splitting the data-flow graph into two subgraphs: (a) the computation subgraph, and (b) the I/O subgraph. The scheme presented in this paper thus enables the creation and interaction of both subgraphs, which in turn yields a deterministic execution. Furthermore, the proposed scheme enables the distributed execution of I/O operations as permitted by data dependencies.

2836 (CONF-9104425–1) **Input/Output operations for hybrid data-flow/control-flow systems.** Evripidou, P. (Southern Methodist Univ., Dallas, TX (United States). Dept. of Computer Science and Engineering); Gaudiot, J.L. University of Southern

California, Los Angeles, CA (United States). Dept. of Electrical Engineering. [1991]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER25043. From 5. international parallel processing symposium; Anaheim, CA (United States); 30 Apr - 2 may 1991. Order Number DE94000322. Source: OSTI; NTIS; GPO Dep.

Hybrid data-flow/control-flow system combine the advantages of the data-flow model: functionality and tolerance to communication and memory latencies with the efficient instruction scheduling of the control-flow model. The absence of global state in such hybrid multiprocessors and multiprocessors in general renders the implementation of state tasks such as Input/Output operations very difficult to implement. A distributed file-pointer scheme for incorporations I/O operations onto the data-flow model has been developed. A dependency detection algorithm detects and classify cases of potential access conflicts. A conflict resolution data-flow graph is then created which at execution time safely distributes file-pointers to the I/O actors. This scheme has also been implemented on a hybrid a data-flow control-flow multiprocessor: the Decoupled Data-Driven Multiprocessor with Variable Resolution Actors.

2837 (CONF-9106442–1) **Chaotic linear system solvers in a variable-grain data-driven multiprocessor system.** Gaudiot, J.L.; Lin, Chih-Ming. University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering. [1991]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER25043. From Conference on parallel architectures and languages; Eindhoven (Netherlands); Jun 1991. Order Number DE94000319. Source: OSTI; NTIS; GPO Dep.

Linear systems are important problems in many scientific applications. While asynchronous methods are effective solutions to linear systems, they are difficult to realize due to the chaotic behavior of the algorithms. In this paper, we investigate the implementation as well as the performance of an asynchronous method, namely chaotic relaxation, in our Variable-grain TaggedToken Dataflow (VTD) System. We compare asynchronous methods with synchronous methods executed on both the fine-grain and the coarse-grain execution models. New high-level dataflow language constructs axe introduced in order to express asynchronous operations. A new firing rule that deviates from the single assignment rule of functional languages is proposed to support the implementation of asynchronous computations in the VTD system. In addition to the conventional speedup measure, we then define new performance measurements, called Growth Factor, Scalability Factor, and Robustness to characterize the system performance from the machine and application viewpoints. Simulation results indicate that asynchronous methods axe more efficient than synchronous methods and that the coarse-grain execution mode is more efficient that the fine-grain execution mode in our VTD system.

2838 (CONF-9305285–1) **Reverse automatic differentiation of modular FORTRAN programs.** Horwedel, J.E. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Theory Institute on combinatorial challenges in computational differentiation workshop; Argonne, IL (United States); 24-26 May 1993. Order Number DE94000336. Source: OSTI; NTIS; GPO Dep.

Short communication DIFFERENTIAL CALCULUS/computer codes; FORTRAN; AUTOMATION; NONLINEAR PROBLEMS

2839 (CONF-9308176–1) **Hypersingular integrals at a corner.** Gray, L.J.; Manne, L.L. Oak Ridge National Lab., TN (United States). 25 Mar 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 15. boundary element methods (BEM) conference; Worcester, MA (United States); 10-12 Aug 1993. Order Number DE94000340. Source: OSTI; NTIS; GPO Dep.

For a smooth boundary, hypersingular integrals can be defined as a limit from the interior, the approach direction being taken, for convenience, normal to the surface. At a boundary corner, the limit process, with a necessarily non-normal approach direction, provides a valid definition of the hypersingular equation, as long as the direction is employed for all integrations. The terms which are potentially singular in the limit are shown to cancel, provided the function approximations at the corner are consistent. The analytical formulas for the singular integrals are more complicated than for a smooth surface, but are easily obtained using symbolic computation. These techniques have been employed to accurately solve the "L-shaped domain" potential problem considered by Jaswon and Symm.

2840 (CONF-9309239–1) **N-Learners Problem: System of PAC learners.** Rao, N.S.V.; Oblow, E.M. Oak Ridge National Lab., TN (United States). 11 Aug 1993. 5p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract AC05-84OR21400. Grant N0001491F2038;IRI-9108610. From Computational and machine learning workshop; Provincetown, MA (United States); 10-12 Sep 1993. Order Number DE93041047. Source: OSTI; NTIS; GPO Dep.

A system of Probably Approximately Correct (PAC) learners, where each learner had produced a hypothesis by employing empirical risk minimization methods, is considered. When no access to additional examples is available, our objective is to make the system at least as efficient – in terms of normalized precision or confidence – as best of the learners. Two separate cases are studied. In the first case, the training samples used by the individual learners are known; a method that approaches (in a weak convergence sense) the optimal Bayesian fuser is proposed. In the second: Case, the training samples are not known; majority and location-based fusers are shown to achieve the objective.

2841 (CONF-9310100–3) **Eye-gaze control of the computer interface: Discrimination of zoom intent.** Goldberg, J.H. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Industrial Engineering); Schryver, J.C. Oak Ridge National Lab., TN (United States); Oak Ridge Associated Universities, Inc., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ;AC05-76OR00033. From Human Factors and Ergonomics Society meeting; Seattle, WA (United States); 11-15 Oct 1993. Order Number DE94000480. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis methodology and associated experiment were developed to assess whether definable and repeatable signatures of eye-gaze characteristics are evident, preceding a decision to zoom-in, zoom-out, or not to zoom at a computer interface. This user intent discrimination procedure can have broad application in disability aids and telerobotic control. Eye-gaze was collected from 10 subjects in a controlled experiment, requiring zoom decisions. The eye-gaze data were clustered, then fed into a multiple discriminant analysis (MDA) for optimal definition of heuristics separating the zoom-in, zoom-out, and no-zoom conditions. Confusion matrix analyses showed that a number of variable combinations classified at a statistically significant level, but practical significance was more difficult to establish. Composite contour plots demonstrated the regions in parameter space consistently assigned by the MDA to unique zoom conditions. Peak classification occurred at about 1200–1600 msec. Improvements in the methodology to achieve practical real-time zoom control are considered.

2842 (DOE/ER/25068–2) **Parallel mathematical software: Annual report, February 15, 1990–August 14, 1991.** Watson, L.T.; Ribbens, C.J. Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). 31 Jan 1991. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER25068. Order Number DE94001586. Source: OSTI; NTIS; GPO Dep.

Discussed are: Parallel ELLPACK, domain decomposition, parallel scientific computing environments, parallel HOMPACK.

2843 (ENEA-RT-INN–92-48) **Quantum mechanical point of view to perturbative problems in classical mechanics.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A. Mar 1993. 22p. (RT/INN–92-48). Order Number DE94716523. Source: OSTI; NTIS (US Sales Only).

This paper shows that perturbative methods currently exploited in quantum mechanics can be used to treat a classical Liouville problem describing the evolution of an ensemble of non-collisional particles. The method we discuss is based on the introduction of the concept of evolution operator and of interaction picture for a classical Hamiltonian. The usefulness of the developed method to

treat the quantum extension of the Liouville equation is also stressed.

2844 (ENEA-RT-NUCL–92-38) **Pre-Maxwell system revisited.** Lo Surdo, C. (ENEA, Frascati (Italy). Area Nucleare). Jan 1993. 55p. (RT/NUCL–92-38). Order Number DE94716522. Source: OSTI; NTIS (US Sales Only).

This paper provides a reasonably accurate discussion of the so-called 'Pre Maxwell' PD system (the asymptotic limit of the Maxwell PD system), for a given 'source' current-density, and in a linear homogeneous medium. The analysis focuses on the associated curldiv elliptic systems and on questions related to the (generally non-simple) topology of the independent-variable space domain.

2845 (ESTSC–000324SUN0002) **EQ3/6 V7.2: Geochemical Modeling Of Aqueous Systems.** Wolery, T.J. (Lawrence Livermore National Lab., CA (United States)). Lawrence Livermore National Lab., CA (United States). 1 Sep 1992. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Source: ESTSC; Lawrence Livermore National Lab.

Description: SUN; UNIX; ANSI FORTRAN 77; UNIX interface software, C-shell UNIX; 2 3.5 Diskettes. EQ3NR input files end in .3i, EQ6 input files end in .6i. This is a recommended convention, and it is required in order to run these codes using the UNIX interface software. The data file names have the form exemplified by data0.comR22. Here com is one of the five data file descriptors and R22 is a stage number (a configuration control identifier). The main code FORTRAN source files end in .fsc. The EQLIB library package supports the EQPT, EQ3NR, and EQ6 codes.This library is included with the package.

EQ3/6 is a software package for geochemical modeling of aqueous systems. This description pertains to version 7.2. It addresses aqueous speciation, thermodynamic equilibrium, disequilibrium, and chemical kinetics. The major components of the package are EQ3NR a speciation-solubility code and EQ6, a reaction path code. EQ3NR is useful for analyzing groundwater chemistry data., calculating solubility limits, and determining whether certain reactions are in states of equilibrium or disequilibrium. It also initializes EQ6 calculations. EQ6 models the consequences of reacting an aqueous solution with a specified set of reactants (e.g. minerals or waste forms). It can also model fluid mixing and the effects of changes in temperature. Each of five supporting data files contains both standard state and activity coefficient-related data. Three support the use of the Davies or B-dot equations for the activity coefficients; the other two support the use of Pitzer's equations. The temperature range of the thermodynamic data on the data files varies from only 25 degrees C to 0-300 degrees C.

2846 (ESTSC–000605SPARC00) **CCLAMP: Cryogenic Current Lead Analysis Model Program.** Demko, J. (Superconducting Super Collider Laboratory, Dallas, TX (United States)); Carcagno, R.; Schiesser, W.E. Superconducting Super Collider Lab., Dallas, TX (United States). 1 Apr 1993. Sponsored by USDOE, Washington, DC (United States). Source: ESTSC.

Description: SUN SPARC; Machine Dependent; FORTRAN77; 1 3.5 Diskette. All of the source code files are filename.f. A sample input and output are contained in SEND.OUT. Differences in level of FORTRAN 77 compliance from mainframe, SUN, and PC based compilers, revealed minor errors and warnings.

CCLAMP was developed to provide a tool for tha analysis of superconducting or normal current leads used to supply electricity from a warm interface (usually room temperature) to a device at cryogenic temperatures. It determines the heat leak to the cyrogenic connection and the mass flow of the cryogen (typically helium) for the lead and installation modelled. It may be used to thermally optimize a lead design for a particular application. The user provides relevant geometry details to model the electrical (length, diameter, superconducting length) and heat exchanger design of the lead (heat transfer coefficient, heat transfer area). It has a transient analysis capability so that lead transients such as cool down, current ramping, flow disruptions, and control simulations can be performed.

2847 (ESTSC–000616IBMPC00) **PCIS1.0.1: Personal Computer Inventory System.** Sampson, J. (Analysas Corp, Oak Ridge, TN (United States)); McNeil, M.; Treadwell, L. Oak Ridge Y-12 Plant, TN (United States). 1 May 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001. Source: ESTSC.

Description: IBM PC; MS-DOS; VMS; dBASE IV; FoxPro v2.0; 1 3.5 Diskette. The source programs and editable query files have .PRG or .QBE extensions. To install the system copy all files with .COM, .DBO, .DBF, and .MDX. It would be a good idea to store them in a separate directory to prevent accidental recompilation if a source program were to be modified. Installation on a PC: The system must be executed from the directory in which it is installed (database, index, and executable filees must be located in the same directory).

PCIS is a database software system that is used to maintain a personal computer hardware and software inventory, track transfers of hardware and software, and provide reports.

2848 (ESTSC/NRC–000096I303300) **FEMWATER1/FEMWASTE1: Water or Waste Transport.** Yeh, G.T. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). 1 Jun 1982. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research. (NESC–9902). Source: ESTSC.

Description: IBM3033; MVS; FORTRAN IV; 1 Mag Tape.

The programs model water flow and waste transport through saturated or unsaturated porous media. The models are designed to treat inhomogeneous and anisotropic media consisting of as many geologic formations as desired, to consider spatial and temporal distributed as well as time-dependent point sources/sinks, to accept the prescribed initial conditions or to obtain them by simulating the steady-state version of the system under time-invariant boundary conditions, to deal with the transient head distributed over the Dirichlet boundary or with the prescribed transient concentrations on the Dirichlet boundary in, to handle time dependent fluxes due to a pressure gradient or a concentration gradient varying along the Neumann boundary, to treat time dependent total fluxes distributed over the Cauchy boundary, to automatically determine variable boundary conditions of evaporation, infiltration or seepage on the air-soil interface or the variable boundary conditions of the second or third type over the flow through boundaries, to include the nonlinear adsorptions such as Langmuir and Freundlich isotherms as well as the linear isotherm so the model can deal with cases when high concentrations or very diluted concentrations are involved, to provide 6 or 12 alternative numerical schemes for the derivation of the matrix equation that approximates the governing partial differential equation, to give three options (exact, under, and over relaxation) for solving the nonlinear matrix equation, to include two options for obtaining the iterate in the matrix equation, to check the mass balance computation over the entire region for every time-step, to automatically reset time-step size when the boundary conditions or sources/sinks change abruptly, to include both quadrilateral and triangular elements for facilitating the discretization of the region.

2849 (FEI–2244) **Solution of charged particle transport equation by Monte-Carlo method in the BRANDZ code system.** Artamonov, S.N.; Androsenko, P.A.; Androsenko, A.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 25p. (In Russian). Order Number DE94606270. Source: OSTI; NTIS (US Sales Only); INIS.

Consideration is given to the issues of Monte-Carlo employment for the solution of charged particle transport equation and its implementation in the BRANDZ code system under the conditions of real 3D geometry and all the data available on radiation-to-matter interaction in multicomponent and multilayer targets. For the solution of implantation problem the results of BRANDZ data comparison with the experiments and calculations by other codes in complexes systems are presented. The results of direct nuclear pumping process simulation for laser-active media by a proton beam are also included. 4 refs.; 7 figs.

2850 (INIS-mf–13731, pp. 83) **Computer simulation of the etching process of the fission track.** Deng Xinlu (Dalian Univ. of technology (China). Dept. of Physics). Academia Sinica, Beijing, BJ

(China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413– : 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ETCHING/computerized simulation; FISSION TRACKS/etching; DENSITY; ETCHING; MICROCOMPUTERS; MICROPROCESSORS

2851 (INIS-mf–13731, pp. 148) **Version 3.0 'ATOM' software with built-in motorized stage control for optical microscopy analysis of nuclear tracks.** Rebetez, M. (Univ. de Franche-Comte, U.F.R. des Sciences et des Techniques, Lab. de Microanalyses Nucleaires (France)); Petit, D.; Nicot, R.; Grivet, M.; Ghouma, N.B.; Chambaudet, A. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413– : 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/apatites; FISSION TRACKS/microscopes; MICROSCOPES/a codes; CONTROL; APATITES; MICROSCOPES; IMAGE PROCESSING; POSITIONING

2852 (INIS-mf–13731, pp. 379) **Simulation of a thermoluminescent $CaSO_4$: Dy dosemeter for beta radiation detection.** Luguera, E. (Fisica de les Radiacions, Dept. de Fisica, Univ. Autonoma de Barcelona (Spain)); Fernandez, F.; Al-Khatib, I.; Baixeras, C.; Domingo, C.; Serviere, H. Academia Sinica, Beijing, BJ (China). Inst. of Atomic Energy. Sep 1992. 383p. (CONF-9209413–: 16. international conference on nuclear tracks in solids, Beijing (China), 7-11 Sep 1992). In *16. international conference on nuclear tracks in solids: abstracts.* Order Number DE94604043. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMOLUMINESCENT DOSEMETERS/beta detection; THERMOLUMINESCENT DOSEMETERS/simulation; CALCIUM SULFATES; DYSPROSIUM; E CODES; MONTE CARLO METHOD; SIMULATION

2853 (JINR-R–4-92-297) **Variational calculation of the eigenpotential for H^--system.** Belyaev, V.B.; Kartavtsev, O.I.; Kochkin, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 6p. (In Russian). Order Number DE94606269. Source: OSTI; NTIS (US Sales Only); INIS.

The variational approach is applied for the calculation of the eigenfunctions and eigenvalues of the surface function equatuion, arising in the solution of the two-electron atom problem in hyperspherical variables. The variational ansatz matches with the asynmptotic behaviour at small and large values of the hyperradius. 6 refs.; 2 tabs.

2854 (JINR-R–10-92-317) **Application of discrete transformations in the problem of preliminary data processing for experiments in high energy physics. Case of correlated measuremenet errors.** Ososkov, G.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Pospelov, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 10p. (In Russian). Order Number DE94606266. Source: OSTI; NTIS (US Sales Only); INIS.

The given paper continues the study for the preliminary analysis of elementary particles tracks. Assuming linear model with S parameters for a track measured in N points, a method was proposed in for selecting track-candidates from all possible point combinations. It was based on discrete transformation of these combinations to the subspace of N-S features. This method is generalized here on the important case of multiple scattering, when measurements are correlated. Computational difficulties caused by necessity of square root extracting from the covariance matrix of measuremenets were surmounted in the general case by sequential using of simple cut-off criteria. In the particular case, when the covariance matrix determined a track as a markov process, the exact solution is found. Results of numerical experimenta are given. 4 refs.; 3 tabs.

2855 (JINR-R–10-92-370) **Simulation of experiments on deep inelastic scattering of muons on superconducting magnetic toroidal spectrometer STORS.** Bonyushkina, A.Yu. (and others); Genchev, V.I.; Ivanchenko, I.M. Joint Inst. for Nuclear Research. Dubna (Russian Federation). 1992. 16p. (In Russian). Order Number DE94606267. Source: OSTI; NTIS (US Sales Only); INIS.

Methods and results of precision estimate of kinematic parameter calculation of deep inelastic scattering of muons are analysed for a choice configuration of the set-up. The suggested method for calculation track parameters takes into account nonlinear effects that depend on the motion of high energy particles in complicated magnetic field, energy losses, multiply scattering and measurement errors. A calculation experiment shows high precision of the method. Summary estimate is 1% approximately for realistic conditions of experiment. 19 refs.; 7 figs.; 2 tabs.

2856 (JINR-R–10-92-386) **Modelling of the off-line data processing in high-energy physics using CAA COMEX.** Ivanov, V.G.; Fernandez Nodarse, F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 15p. (In Russian). Order Number DE94606139. Source: OSTI; NTIS (US Sales Only); INIS.

The goal of the study is to model the off-line data processing in order to define an optimal configuration on the computer system and to detect and solve its bottlenecks. 11 refs.; 1 fig.; 2 tabs.

2857 (JINR-R–10-93-15) **Specialized data base management system for data processing in the experiments at low energies.** Andreev, A.N.; Vakatov, D.V.; Veselsky, M.; Mal'tseva, S.M.; Nikitin, V.F.; Nikitina, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 10p. (In Russian). Order Number DE94606268. Source: OSTI; NTIS (US Sales Only); INIS.

The work contains a description of the data base management system (DBMS) designed for automating the physical experiments being performed by using a kinematic separator of recoil nuclei VASILISA. However, a wide spectrum of the possibilities built into the system makes possible its application to the other experiments in the field of low energies. It is a closed-type system with three-level architecture oriented to the abstract type of data. It possesses many features of the promising DBMS of the third generation. 5 refs.

2858 (JINR-R–10-93-40) **The program for catalogization of magnetic tapes in EXCHARM experiment.** Kamburyan, A.F.; Potrebenikov, Yu.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 7p. (In Russian). Order Number DE94606271. Source: OSTI; NTIS (US Sales Only); INIS.

The features of catalogization program created in frames of database management system CLARION are described. The simplicity of the program organization, its updatability and extendability allow one to use it for analogue purposes in other experiments. 6 refs.; 2 figs.

2859 (JINR-R–11-92-164) **Techniques of collecting, controling and analyzing information about functioning LAN JINET.** Mazepa, E.Yu. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Parsadanyan, N.G.; Fariseev, V.Ya.; Modebadze, Z.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 12p. (In Russian). Order Number DE94606272. Source: OSTI; NTIS (US Sales Only); INIS.

The brief description of programming capability for controling and analyzing information about functioning LAN JINET is presented. Operating in the menu mode an administrator and engineer of JINET are consider a network temprorary state, tracing map of token and statistic of commands, used by users of the network. 5 refs.; 10 figs.

2860 (LA-SUB–93-236) **Radar stimulator interface protocol, preliminary interface design and Doppler beam sharpening implementation.** Aldrich, C.H. (Mission Research Corp., Los Alamos NM (United States)). Los Alamos National Lab., NM (United States); Mission Research Corp., Los Alamos, NM (United States). Jun 1993. 23p. Sponsored by Department of Defense,

Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94002567. Source: OSTI; NTIS; GPO Dep.

This is the final report for a subcontract to supply a doppler beam sharpening model to interface with the radar simulation package running on the Cray supercomputers. The article describes the beam sharpening model, and the way beam sharpening is implemented by the model. Changes from previous work are emphasized in this report.

2861 (LA-UR–93-3072) **The accuracy-through-order and the equivalence properties in the algebraic approximant.** Baker, G.A. Jr. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant INT-90-13977. (CONF-9309227–1: Nonlinear numerical methods and rational approximation, Antwerp (Belgium), 6-10 Sep 1993). Order Number DE93040188. Source: OSTI; NTIS; GPO Dep.

In addition to the accuracy-through-order requirement that the defining polynomials not all be divisible by z, as required for Pade and integral approximants, there is the further problem of deficiency as pointed out by McInnes. I prove a finite bound on the deficiency and also prove the accuracy-through-order property for algebraic approximants. In addition I prove the equivalence property for algebraic approximants.

2862 (LA-UR–93-3138) **A data distributed, parallel algorithm for ray-traced volume rendering.** Ma, Kwan-Liu (Utah Univ., Salt Lake City, UT (United States). Dept. of Computer Science); Painter, J.S.; Hansen, C.D.; Krogh, M.F. Los Alamos National Lab., NM (United States). 30 Mar 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310153–1: Parallel rendering symposium, San Jose, CA (United States), 25 Oct 1993). Order Number DE93040150. Source: OSTI; NTIS; GPO Dep.

This paper presents a divide-and-conquer ray-traced volume rendering algorithm and its implementation on networked workstations and a massively parallel computer, the Connection Machine CM-5. This algorithm distributes the data and the computational load to individual processing units to achieve fast, high-quality rendering of high-resolution data, even when only a modest amount of memory is available on each machine. The volume data, once distributed, is left intact. The processing nodes perform local ray-tracing of their subvolume concurrently. No communication between processing units is needed during this locally ray-tracing process. A subimage is generated by each processing unit and the final image is obtained by compositing subimages in the proper order, which can be determined a priori. Implementations and tests on a group of networked workstations and on the Thinking Machines CM-5 demonstrate the practicality of our algorithm and expose different performance tuning issues for each platform. We use data sets from medical imaging and computational fluid dynamics simulations in the study of this algorithm.

2863 (LA-UR–93-3140) **Geometric optimization.** Hinker, P.; Hansen, C. Los Alamos National Lab., NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931080–4: Visualization '93, San Jose, CA (United States), 25-29 Oct 1993). Order Number DE93040152. Source: OSTI; NTIS; GPO Dep.

An algorithm is presented which describes an application independent method for reducing the number of polygonal primitives required to faithfully represent an object. Reducing polygon count without a corresponding reduction in object detail is important for: achieving interactive frame rates in scientific visualization, reducing mass storage requirements, and facilitating the transmission of large, multi-timestep geometric data sets. This paper shows how coplanar and nearly coplanar polygons can be merged into larger complex polygons and re-triangulated into fewer simple polygons than originally required. The notable contributions of this paper are: (1) a method for quickly grouping polygons into nearly coplanar sets, (2) a fast approach for merging coplanar polygon sets and, (3) a simple, robust triangulation method for polygons created by 1 and 2. The central idea of the algorithm is the notion of treating polygonal data as a collection of segments and removing redundant segments to quickly form polygon hulls which represent the merged coplanar sets.

2864 (LBL–34384) **General asymmetric neutral networks and structure design by genetic algorithms: A learning rule for temporal patterns.** Bornholdt, S. (Heidelberg Univ., (Germany). Inst., fuer Theoretische Physik); Graudenz, D. Lawrence Berkeley Lab., CA (United States). Jul 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (HD-THEP–93-26). Order Number DE94001254. Source: OSTI; NTIS; INIS; GPO Dep.

A learning algorithm based on genetic algorithms for asymmetric neural networks with an arbitrary structure is presented. It is suited for the learning of temporal patterns and leads to stable neural networks with feedback.

2865 (NUREG/CR–6113) **Class 1E digital systems studies.** Hecht, H. (SoHaR, Inc., Beverly Hills, CA (United States)); Tai, A.T.; Tso, K.S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; SoHaR, Inc., Beverly Hills, CA (United States); Air Force Rome Lab., Griffiss AFB, NY (United States). Oct 1993. 197p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This document is furnished as part of the effort to develop NRC Class 1E Digital Computer Systems Guidelines which is Task 8 of USAF Rome Laboratories Contract F30602-89-D-0100. The report addresses four major topics, namely, computer programming languages, software design and development, software testing and fault tolerance and fault avoidance. The topics are intended as stepping stones leading tc a Draft Regulatory Guide document. As part of this task a small scale survey of software fault avoidance and fault tolerance practices was conducted among vendors of nuclear safety related systems and among agencies that develop software for other applications demanding very high reliability. The findings of the present report are in part based on the survey and in part on review of software literature relating to nuclear and other critical installations, as well as on the authors' experience in these areas.

2866 (ORNL/Sub–91-SH641/1) **Enhanced absorption cycle computer model: Final report.** Grossman, G. (Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Mechanical Engineering); Wilk, M. Oak Ridge National Lab., TN (United States); Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Mechanical Engineering. Sep 1993. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001997. Source: OSTI; NTIS; GPO Dep.

Absorption heat pumps have received renewed and increasing attention in the past two decades. The rising cost of electricity has made the particular features of this heat-powered cycle attractive for both residential and industrial applications. Solar-powered absorption chillers, gas-fired domestic heat pumps, and waste-heat-powered industrial temperatures boosters are a few of the applications recently subjected to intensive research and development. The absorption heat pump research community has begun to search for both advanced cycles in various multistage configurations and new working fluid combinations with potential for enhanced performance and reliability. The development of working absorptions systems has created a need for reliable and effective system simulations. A computer code has been developed for simulation of absorption systems at steady state in a flexible and modular form, making it possible to investigate various cycle configurations with different working fluids. The code is based on unit subroutines containing the governing equations for the system's components and property subroutines containing thermodynamic properties of the working fluids. The user conveys to the computer an image of his cycle by specifying the different subunits and their interconnections. Based on this information, the program calculates the temperature, flow rate, concentration, pressure, and vapor fraction at each state point in the system, and the heat duty at each unit, from which the coefficient of performance (COP) may be determined. This report describes the code and its operation, including improvements introduced into the present version. Simulation results are described for LiBr-H_2O triple-effect cycles, LiCl-H_2O solar-powered open absorption cycles, and NH_3-H_2O

single-effect and generator-absorber heat exchange cycles. An appendix contains the User's Manual.

2867 (ORNL/TM–12285) **Implementation and parallelization of fast matrix multiplication for a fast Legendre transform.** Chen, Wentao (Denison Univ., Granville, OH (United States)). Oak Ridge National Lab., TN (United States). Sep 1993. 30p. Sponsored by USDOE, Washington, DC (United States); Great Lakes Colleges Association/Associated Colleges of the Midwest (United States). DOE Contract AC05-84OR21400. Order Number DE94002184. Source: OSTI; NTIS; GPO Dep.

An algorithm was presented by Alpert and Rokhlin for the rapid evaluation of Legendre transforms. The fast algorithm can be expressed as a matrix-vector product followed by a fast cosine transform. Using the Chebyshev expansion to approximate the entries of the matrix and exchanging the order of summations reduces the time complexity of computation from $O(n^2)$ to $O(n \log n)$, where n is the size of the input vector. Our work has been focused on the implementation and the parallelization of the fast algorithm of matrix-vector product. Results have shown the expected performance of the algorithm. Precision problems which arise as n becomes large can be resolved by doubling the precision of the calculation.

2868 (ORNL/TM–12404) **The design of linear algebra libraries for high performance computers.** Dongarra, J.J. (Tennessee Univ., Knoxville, TN (United States). Dept. of Computer Science); Walker, D.W. Oak Ridge National Lab., TN (United States). Aug 1993. 56p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Contract DAAL03-91-C-0047. Order Number DE93040458. Source: OSTI; NTIS; GPO Dep.

This paper discusses the design of linear algebra libraries for high performance computers. Particular emphasis is placed on the development of scalable algorithms for MIMD distributed memory concurrent computers. A brief description of the EISPACK, LINPACK, and LAPACK libraries is given, followed by an outline of ScaLAPACK, which is a distributed memory version of LAPACK currently under development. The importance of block-partitioned algorithms in reducing the frequency of data movement between different levels of hierarchical memory is stressed. The use of such algorithms helps reduce the message startup costs on distributed memory concurrent computers. Other key ideas in our approach are the use of distributed versions of the Level 3 Basic Linear Algebra Subprograms (BLAS) as computational building blocks, and the use of Basic Linear Algebra Communication Subprograms (BLACS) as communication building blocks. Together the distributed BLAS and the BLACS can be used to construct higher-level algorithms, and hide many details of the parallelism from the application developer. The block-cyclic data distribution is described, and adopted as a good way of distributing block-partitioned matrices. Block-partitioned versions of the Cholesky and LU factorizations are presented, and optimization issues associated with the implementation of the LU factorization algorithm on distributed memory concurrent computers are discussed, together with its performance on the Intel Delta system. Finally, approaches to the design of library interfaces are reviewed.

2869 (ORNL/TM–12426) **A sharp upper bound for departure from normality.** Lee, S.L. Oak Ridge National Lab., TN (United States). Aug 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93040457. Source: OSTI; NTIS; GPO Dep.

The departure from normality of a matrix is a real scalar that is impractical to compute if a matrix is large and its eigenvalues are unknown. A simple formula is presented for computing an upper bound for departure from normality in the Frobenius norm. This new upper bound is cheaper to compute than the upper bound derived by Henrici. Moreover, the new bound is sharp for Hermitian matrices, skew-Hermitian matrices and, in general, any matrix with eigenvalues that are horizontally or vertically aligned in the complex plane. In terms of applications, the new bound can be used in computing bounds for the spectral norm of matrix functions or bounds for the sensitivity of eigenvalues to matrix perturbations.

2870 (PNL–8924) **CMS Preprocessing Subsystem user's guide: Software version 1.2.** Didier, B.T.; Gash, J.D.; Greitzer, F.L.; Havre, S.L.; Ramsdell, J.V.; Turney, C.R. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 74p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001846. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Common Mapping Standard (CMS) Data Production System (CDPS) produces and distributes CMS data in compliance with the Common Mapping Standard Interface Control Document, Revision 2.2. Historically, tactical mission planning systems have been the primary clients of CMS data. CDPS is composed of two subsystems, the CMS Preprocessing Subsystem (CPS) and the CMS Distribution Subsystem (CDS). This guide describes the operation of CPS, which is responsible for the management of source data and the production of CMS data from source data. The CPS system was developed for use on a workstation running Ultrix 4.2, and X Window System Version X11R4, and Motif Version 1.1. This subsystem is organized into four major functional groups: CPS Executive; Manage Source Data; Manage CMS Data Preprocessing; and CPS System Utilities. CPS supports the production of CMS data from the following source chart, image, and elevation data products: Global Navigation Chart; Jet Navigation Chart; Operational Navigation Chart; Tactical Pilotage Chart; Joint Operations Graphics-Air; Topographic Line Map; ARC Digital Raster Imagery; Digital Terrain Elevation Data (Level 1); and Low Flying Chart.

2871 (PNL-SA–21755) **Translative interface for data sharing and integrating: A paradigm for distributed data systems.** Maloney, T.F. Pacific Northwest Lab., Richland, WA (United States). Apr 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9304201–1: Sybase user's conference, San Jose, CA (United States), 28 Apr 1993). Order Number DE93018790. Source: OSTI; NTIS; GPO Dep.

Typically, applications are built only after the database schema is available. To enable the application designer/programmer with the tools necessary to forge ahead without having to wait for the data schema definition, a change from traditional methodologies must take place. This paper proposes an alternate design methodology intended to bring applications on-line as soon as possible. We will look at using Inmon's paradigm for decision support systems and tie it together with Martin's subject databases used in a distributed data system.

2872 (SAND–93-0205C) **A doubly logarithmic communication algorithm for the Completely Connected Optical Communication Parallel Computer.** Goldberg, L.A. (Sandia National Labs., Albuquerque, NM (United States)); Jerrum, M.; Leighton, T.; Rao, S. Sandia National Labs., Albuquerque, NM (United States). 20 Jan 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9306220–1: 5. annual Association for Computing Machinery on parallel algorithms and architectures, Velen (Germany), 30 Jun - 2 jul 1993). Order Number DE93019408. Source: OSTI; NTIS; GPO Dep.

In this paper we consider the problem of interprocessor communication on a Completely Connected Optical Communication Parallel Computer (OCPC). The particular problem we study is that of realizing an h-relation. In this problem, each processor has at most h messages to send and at most h messages to receive. It is clear that any 1-relation can be realized in one communication step on an OCPC. However, the best known p-processor OCPC algorithm for realizing an arbitrary h-relation for $h > 1$ requires $\Theta(h + \log p)$ expected communication steps. (This algorithm is due to Valiant and is based on earlier work of Anderson and Miller.) Valiant's algorithm is optimal only for $h = \Omega(\log p)$ and it is an open question of Gereb-Graus and Tsantilas whether there is a faster algorithm for $h = o(\log p)$. In this paper we answer this question in the affirmative by presenting a $\Theta(h + \log \log p)$ communication step algorithm that realizes an arbitrary h-relation on a p-processor OCPC. We show that if $h \leq \log p$ then the failure probability can be made as small as $p^{-\alpha}$ for any positive constant α.

2873 (SAND–93-0438C) **Stochastic simulation for imaging spatial uncertainty: Comparison and evaluation of available algorithms.** Gotway, C.A. (Nebraska Univ., Lincoln, NE (United States). Dept. of Biometry); Rutherford, B.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9305268–1: Workshop in english on geostatistical simulations, Fontainebleau (France), 27 May 1993). Order Number DE93040058. Source: OSTI; NTIS; GPO Dep.

Stochastic simulation has been suggested as a viable method for characterizing the uncertainty associated with the prediction of a nonlinear function of a spatially-varying parameter. Geostatistical simulation algorithms generate realizations of a random field with specified statistical and geostatistical properties. A nonlinear function is evaluated over each realization to obtain an uncertainty distribution of a system response that reflects the spatial variability and uncertainty in the parameter. Crucial management decisions, such as potential regulatory compliance of proposed nuclear waste facilities and optimal allocation of resources in environmental remediation, are based on the resulting system response uncertainty distribution. Many geostatistical simulation algorithms have been developed to generate the random fields, and each algorithm will produce fields with different statistical properties. These different properties will result in different distributions for system response, and potentially, different managerial decisions. The statistical properties of the resulting system response distributions are not completely understood, nor is the ability of the various algorithms to generate response distributions that adequately reflect the associated uncertainty. This paper reviews several of the algorithms available for generating random fields. Algorithms are compared in a designed experiment using seven exhaustive data sets with different statistical and geostatistical properties. For each exhaustive data set, a number of realizations are generated using each simulation algorithm. The realizations are used with each of several deterministic transfer functions to produce a cumulative uncertainty distribution function of a system response. The uncertainty distributions are then compared to the single value obtained from the corresponding exhaustive data set.

2874 (SAND–93-1249C) **Becoming a better host through origami: A mesh is more than rows and columns.** Greenberg, D.S. (Sandia National Labs., Albuquerque, NM (United States)); Park, J.K.; Schwabe, E.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931220–1: 5. Institute of Electrical and Electronics Engineers (IEEE) symposium on parallel and distributed processing, Dallas, TX (United States), 1-4 Dec 1993). Order Number DE93018836. Source: OSTI; NTIS; GPO Dep.

The ability for a communications network to realize arbitrary communications patterns can be expensive both in terms of hardware and in terms of system software. One might instead ask whether a system can be built which performs well for a given application program. In this paper we look at the question of when a set of communications patterns is suitable for fast realization on a given network. In particular we look at which patterns are realizable quickly on a mesh. Contrary to common wisdom, transpose is efficiently realizable on a mesh. However, some other important patterns such as shuffle are not.

2875 (SAND–93-1806C) **Coupling of smooth particle hydrodynamics with the finite element method.** Attaway, S.W.; Heinstein, M.W.; Swegle, J.W. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9308161–1: IMPACT-4: structural mechanics in reactor technology conference, Berlin (Germany), 23-24 Aug 1993). Order Number DE93019081. Source: OSTI; NTIS; GPO Dep.

A gridless numerical technique called smooth particle hydrodynamics (SPH) has been coupled to the transient dynamics finite element code, PRONTO. In this paper, a new weighted residual derivation for the SPH method will be presented, and the methods used to embed SPH within PRONTO will be outlined. Example SPH-PRONTO calculations will also be presented. One major difficulty associated with the Lagrangian fmite element method is modeling materials with no shear strength; for example, gases, fluids and explosive bi-products. Typically these materials can be modeled for only a short time with a Lagrangian finite element code. Large distortions cause tangling of the mesh, which will eventually lead to numerical difficulties such as negative element area or "bow tie" elements. Remeshing win allow the problem to continue for a short while, but the large distortions can prevent a complete analysis. Smooth particle hydrodynamics is a gridless Lagrangian technique. Requiring no mesh, SPH has the potential to model material fracture, large shear flows, and penetration. SPH computes the strain rate and the stress divergence based on the nearest neighbors of a particle, which are determined using an efficient particle sorting technique. Embedding the SPH method within PRONTO allows part of the problem to be modeled with quadrilateral finite elements while other parts are modeled with the gridless SPH method. SPH elements are coupled to the quadrilateral elements through a contact like algorithm.

2876 (SAND–93-1866C) **A lower bound for routing on a completely connected optical communication parallel computer.** Goldberg, L.A. (Sandia National Labs., Albuquerque, NM (United States)); Jerrum, M.; MacKenzie, P.D. Sandia National Labs., Albuquerque, NM (United States). 3 Aug 1993. 19p. Sponsored by USDOE, Washington, DC (United States); Texas Advanced Technology Program, TX (United States). DOE Contract AC04-76DP00789. Grant 003658480. (CONF-940130–1: Symposium on discrete algorithms, Arlington, VA (United States), 23-26 Jan 1994). Order Number DE93040752. Source: OSTI; NTIS; GPO Dep.

The task of routing a 2-relation on an n-processor completely connected optical communication parallel computer (OCPC) is considered. A lower bound is presented that applies to any randomized distributed algorithm for this task: specifically, it is shown that the expected number of steps required to route a 2-relation is $\Omega(\sqrt{\log \log n})$ in the worst case. For comparison, the best upper bound known is O(log log n).

2877 (SOL–93-6) **Algorithmic advances in stochastic programming.** Morton, D.P. Stanford Univ., CA (United States). Systems Optimization Lab. Jul 1993. 116p. Sponsored by USDOE, Washington, DC (United States); National Science Foundation, Washington, DC (United States); Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract FG03-92ER25116. Grant ECS-8906260;Contract RP8010-09. Order Number DE94001160. Source: OSTI; NTIS; GPO Dep.

Practical planning problems with deterministic forecasts of inherently uncertain parameters often yield unsatisfactory solutions. Stochastic programming formulations allow uncertain parameters to be modeled as random variables with known distributions, but the size of the resulting mathematical programs can be formidable. Decomposition-based algorithms take advantage of special structure and provide an attractive approach to such problems. We consider two classes of decomposition-based stochastic programming algorithms. The first type of algorithm addresses problems with a "manageable" number of scenarios. The second class incorporates Monte Carlo sampling within a decomposition algorithm. We develop and empirically study an enhanced Benders decomposition algorithm for solving multistage stochastic linear programs within a prespecified tolerance. The enhancements include warm start basis selection, preliminary cut generation, the multicut procedure, and decision tree traversing strategies. Computational results are presented for a collection of "real-world" multistage stochastic hydroelectric scheduling problems. Recently, there has been an increased focus on decomposition-based algorithms that use sampling within the optimization framework. These approaches hold much promise for solving stochastic programs with many scenarios. A critical component of such algorithms is a stopping criterion to ensure the quality of the solution. With this as motivation, we develop a stopping rule theory for algorithms in which bounds on the optimal objective function value are estimated by sampling. Rules are provided for selecting sample sizes and terminating the algorithm under which asymptotic validity of confidence interval statements for the quality of the proposed solution can be verified. Issues associated with the application of this theory to two

sampling-based algorithms are considered, and preliminary empirical coverage results are presented.

2878 (UCRL-CR–115002) **A prototype Distributed Audit System.** Banning, D.L. (Sparta, Inc., El Segundo, CA (United States)). Lawrence Livermore National Lab., CA (United States); Sparta, Inc., El Segundo, CA (United States). Aug 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001771. Source: OSTI; NTIS; GPO Dep.

Security auditing systems are used to detect and assess unauthorized or abusive system usage. Historically, security audits were confined to a single computer system. Recent work examines ways of extending auditing to include heterogeneous groups of computers (distributed system). This paper describes the design and prototype development of a Distributed Audit System (DAS) which was developed with funding received from Lawrence Livermore Laboratory and through the Master's thesis effort performed by the author at California State University, Long Beach. The DAS is intended to provide collection, transfer, and control of audit data on distributed, heterogeneous hosts.

2879 (UCRL-CR–115020) **Hierarchical analysis of filtration: Progress report.** Quintard, M. (Ecole Nationale Superieure des Arts et Metiers, 33 - Talence (France). Lab. Energetique et Phenomenes de Transfert); Whitaker, S. Lawrence Livermore National Lab., CA (United States); Ecole Nationale Superieure des Arts et Metiers, 33 - Talence (France). Lab. Energetique et Phenomenes de Transfert; California Univ., Davis, CA (United States). Dept. of Chemical Engineering. Jul 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93041116. Source: OSTI; NTIS; GPO Dep.

The original proposal for this work suggested two lines Of analysis that could be used to develop an hierarchical analysis of filtration. The first of these was semi-empirical and required the use of an angle-dependent rate coefficient to model the effect of particle inertia, while the second made use of a particle velocity decomposition that separated the velocity into an inertial part and a diffusive part. We have concluded that the semiempirical approach cannot lead to an efficient treatment of the filtration problem, and in this study we have dirrcted most of our effort toward the development of the velocity decomposition approach. Problems arise with the velocity decomposition method because the panicle tracking equation is hyperbolic in nature, and there are regions in the flow field where it is difficult to calculate the deterministic particle velocity. These problems can be avoided with an asymptotic analysis, and we have used this approach to determine single fiber efficiencies for small Stokes numbers. These efficiencies illustrate a minimum as a function of the particle diameter; however, the range of validity (in terms of the Stokes number) of the asymptotic method is uncertain. If the range of validity of the asymptotic expansion is suitable for the solution of practical problems, the current work on homogeneous filters should be expanded to included a broader range of values of the key parameters and then extended to include the case of heterogeneous filters. If the range of validity of the asymptotic method is not suitable for the solution of practical problems, the particle tracking problem must be resolved or we must move on to the use of Brownian dynamics. This approach is outlined, where we have indicated how Brownian dynamics may be incorporated into the method of volume averaging.

2880 (UCRL-CR–115409) **Results from the DOE Integrated Security System (DISS) encryption communication test.** Sweeney, D.J. Lawrence Livermore National Lab., CA (United States). Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001612. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this test was to document the results of testing an encryption device in the path of the dial-up communications between a remote site and the DISS application residing on a host computer at DOE Headquarters (DOE/HQ) in Germantown, Maryland. With the advent of the DOE Automated Visit and Access Control System (DAVACS) procedures there will be an increase demand on the dial-up communications network at the DOE/HQ computer center. The use of the DOE Integrated Security System (DISS) database for verifying visitor clearance also means an increased sensitivity of the data stored. Even though the information presented in the Classified Visitor Control System (CVCS) application is not classified it is considered sensitive. This document does not deal with whether the current computer system access security measures are adequate for sensitive data. Also not at issue in this document is the determination for the need of additional security above what already exist for the DISS data. This test was not intended to analyze the vulnerability of the communications path or of the encryption device but to test the working issues with encrypting the DISS dial-up communication link with a remote site.

2881 (UCRL-JC–108648-Rev.1) **A characterization of the scientific data analysis process: Revision 1.** Springmeyer, R.R. (Lawrence Livermore National Lab., CA (United States)); Blattner, M.M.; Max, N.L. Lawrence Livermore National Lab., CA (United States). Jul 1992. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-921079–6-Rev.1: Visualization 1992, Boston, MA (United States), 19-23 Oct 1992). Order Number DE94001039. Source: OSTI; NTIS; GPO Dep.

Extensible scientific visualization tools are often offered as data analysis tools. While images may be the goal of visualization, insight is the goal of analysis. Visualization tools often fail to reflect this fact both in functionality and in their user interfaces, which typically focus on graphics and programming concepts rather than on concepts more meaningful to end-user scientists. This paper presents a characterization which shows how data visualization fits into the border process of scientific data analysis. We conducted an empirical study, observing scientists from several disciplines while they analyzed their own data. Examination of the observations exposed process elements outside conventional image viewing. For example, analysts queried for quantitative information, made a variety of comparisons, applied math, managed data, and kept records. The characterization of scientific data analysis reveals activity beyond that traditionally supported by computer. It offers an understanding which has the potential to be applied to many future designs, and suggests specific recommendations for improving the support of this important aspect of scientific computing.

2882 (UCRL-JC–109597) **A novel technology for fabricating customizable VLSI artificial neural network chips.** Fu, C.Y. (Lawrence Livermore National Lab., CA (United States)); Law, B.; Chapline, G.; Swenson, D. Lawrence Livermore National Lab., CA (United States). 5 Feb 1992. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9206102–6: International joint conference on neural networks, Baltimore, MD (United States), 7-11 Jun 1992). Order Number DE94000398. Source: OSTI; NTIS; GPO Dep.

This paper describes an implementation of hardware neural networks using highly linear thin-film resistor technology and an 8-bit binary weight circuit to produce customizable artificial neural network chips and systems. These neural networks are programmed using precision laser cutting and deposition. The fast turnaround of laser-based customization allows us to explore different neural network architectures and to rapidly program the synaptic weights. Our customizable chip allows us to expand an artificial network laterally and vertically. This flexibility permits us to build very large neural network systems.

2883 (UCRL-JC–110366) **Customizable VLSI artificial neural network chips based on a novel technology.** Fu, C. Y. (Lawrence Livermore National Lab., CA (United States)); Law, B.; Chapline, G.; Swenson, D. Lawrence Livermore National Lab., CA (United States). 14 Sep 1993. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-921188–3: Government microcircuit applications conference: microelectronics in the new world order, Las Vegas, NV (United States), 9-12 Nov 1992). Order Number DE94001418. Source: OSTI; NTIS; GPO Dep.

The human cerebral cortex contains approximately 10^{11} neurons and 10^{14} synapses. It thus seems logical that any technology intended to mimic human capabilities should have the ability to fabricate a very large number of neurons and even larger numbers of synapses. This paper describes an implementation of hardware neural networks using highly linear thin-film resistor technology and

an 8-bit binary weight circuit to produce customizable artificial neural network chips and systems.

2884 (UCRL-JC–114360) **Parallel functional programming in Sisal: Fictions, facts, and future.** McGraw, J.R. Lawrence Livermore National Lab., CA (United States). 1 Jul 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9306250–1: Programming tools for parallel machines workshop, Otranto (Italy), 22-26 Jun 1993). Order Number DE93040486. Source: OSTI; NTIS; GPO Dep.

This paper provides a status report on the progress of research and development on the functional language Sisal. This project focuses on providing a highly effective method of writing large scientific applications that can efficiently execute on a spectrum of different multiprocessors. The paper includes sections on the language definition, compilation strategies, and programming techniques intended for readers with little or no background with Sisal. The section on performance presents our most recent results on execution speed for shared-memory multiprocessors, our findings using Sisal to develop codes, and our experiences migrating the same source code to different machines. For large programs, the execution performance of Sisal (with minimal supporting advice from the programmer) usually exceeds that of the best available automatic, vector/parallel Fortran compilers. Our evidence also indicates that Sisal programs tend to be shorter in length, faster to write, and dearer to understand than equivalent algorithms in Fortran. The paper concludes with a substantial discussion of common criticisms of the language and our plans for addressing them. Most notably, efficient implementations for distributed memory machines are lacking; an issue we plan to remedy.

9903 Information Handling

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2885 (CONF-9309246–1) **Distributed processing using Oracle7 and SQL*Net v2: An implementation story.** Loftis, J.P. (Oak Ridge National Lab., TN (United States)); Grubb, J.W. Oak Ridge National Lab., TN (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1993 international oracle users' meeting; Orlando, FL (United States); 26 Sep - 1 oct 1993. Order Number DE94000494. Source: OSTI; NTIS; GPO Dep.

The Army is successfully building on Orcale7 system that includes a central data repository and decentralized processing Hubs. One of the greatest challenges of this project is to connect multiple sites on the East, West, and Gulf Coasts with a database server and to distribute large volumes of data and messages between this database and Orcale7 nodes using SQL*Net. This presentation will describe the problems we encountered, the solutions we found, and our success using Orcale7 and SQL*Net to provide global visibility of shipment cargo.

2886 (ORNL/TM–12419) **FBI Fingerprint Image Capture System High-Speed-Front-End throughput modeling.** Rathke, P.M. Oak Ridge National Lab., TN (United States). Sep 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001115. Source: OSTI; NTIS; GPO Dep.

The Federal Bureau of Investigation (FBI) has undertaken a major modernization effort called the Integrated Automated Fingerprint Identification System (IAFISS). This system will provide centralized identification services using automated fingerprint, subject descriptor, mugshot, and document processing. A high-speed Fingerprint Image Capture System (FICS) is under development as part of the IAFIS program. The FICS will capture digital and microfilm images of FBI fingerprint cards for input into a central database. One FICS design supports two front-end scanning subsystems, known as the High-Speed-Front-End (HSFE) and Low-Speed-Front-End, to supply image data to a common data processing subsystem. The production rate of the HSFE is critical to meeting the FBI's fingerprint card processing schedule. A model of the HSFE has been developed to help identify the issues driving the production rate, assist in the development of component specifications, and guide the evolution of an operations plan. A description of the model development is given, the assumptions are presented, and some HSFE throughput analysis is performed.

2887 (SAND–93-1446C) **Knowing what you have to manage: The Sandia National Laboratories Records Inventory Project.** Pruett, N.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9310145–1: INFOTECH '93, Oak Ridge, TN (United States), 20-23 Oct 1993). Order Number DE94001203. Source: OSTI; NTIS; GPO Dep.

The first step in managing any kind of information is to know what you have. The DOE-required, site-wide records inventory provides an opportunity to identify and describe a broad range of records, including databases and other electronic records. The records inventory data will be used to create a retention schedule (a policy document which describes Sandia's records, who "owns" each series, and how long each series should be kept). It will also be the basis for developing better life cycle information management processes. A discussion of the inventory as a foundation for better information management follows a summary of the project divided into three topics: (1) background on Sandia and its information management environment; (2) the requirements that are driving the inventory; and (3) the inventory plans, process and results so far.

2888 (SAND–93-2130C) **A comparison of IDEF1X and NIAM ISDM.** Sharp, J.K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 13p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9309238–1: 1993 conference on natural language information analysis methodology and information system design methodology, Utrecht (Netherlands), 15-17 Sep 1993). Order Number DE93040899. Source: OSTI; NTIS; GPO Dep.

This paper describes the major differences in the IDEFIX and NIAM ISDM information modeling methodologies and presents the different philosophies behind these methodologies. The IDEFIX methodology base document comes from the Integrated Information Support System (IISS) project sponsored by the US Air Force. The IISS project office was contacted and they supplied the referenced document as the best base description of this methodology. The NIAM ISDM methodology base documents present the general NIAM methodology. IDEFIX is a variant of the entity-attribute-relationship (E-A-R) approach to data modeling and although many other variants exist, the comparison presented here covers the common aspects of entity-relationship approaches. This comparison identifies and illustrates the differences in the two methodologies.

2889 (UCRL-ID–114807) **High speed data acquisition for the High Pressure Laboratory.** Koide, G. (Hawaii Univ., Hilo, HI (United States)); Metz, T.R. Lawrence Livermore National Lab., CA (United States). Jul 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94001545. Source: OSTI; NTIS; GPO Dep.

This report discusses menu driven 16-bit data acquisition system has been developed to accept data at a maximum rate of two thousand samples per second. With a maximum of eight separate channels, calibrated prior to running a test, real-time plots are shown on the monitor as data are stored on the hard disk. After an experimental run, hard copies may be obtained with a plotter by running a separate program called Graph.

2890 (UCRL-JC–111732) **Structure and flow of data through an environmental data management system.** Chamberlain, C.S.; Cederwall, P.L. Lawrence Livermore National Lab., CA (United States). Feb 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9304206–1: HAZMACON 93: hazardous materials conference, San Jose, CA (United States), 6-8 Apr 1993). Order Number DE93040487. Source: OSTI; NTIS; GPO Dep.

Efficient data management is crucial to environmental investigations. The management system must provide for organized data tracking, storage, and retrieval of data essential to successful environmental management. Ultimately, the system is used as an environmental management tool for remediation decisionmaking.

This paper will describe the structure and flow of data in the data management system used by the Environmental Restoration Division of the Environmental Protection Department of Lawrence Livermore National Laboratory (LLNL). The structure is based on three relational databases that are closely correlated. The first database handles sample tracking. The second database handles nondiscrete data, such as sample location, media, analytical results, and some geological information. These two databases are maintained on a VAX 63 10 with VMS, using INGRES relational database software. The third database handles nondiscrete data like graphic imaging flies and geophysical logs and will be run on an IPC Sparc, using INGRES. The flow of data, both hard copy and electronic, follows a model that tracks information from sampling plan through decisionmaking (Fig. 1). The steps in the process include chain-of-custody (CoC) tracking of the sample, receipt of analytical results, application of quality control procedures. and electronic use of data in decision support tools, such as graphic imaging, model development and verification, or statistical analysis.

2891 (UCRL-JC–113691) **LLNL on-line surplus chemical exchange data base.** Gonzalez, M.A. Lawrence Livermore National Lab., CA (United States). 14 Apr 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930483–14: 9. waste minimization and pollution prevention conference, San Francisco, CA (United States), 13-15 Apr 1993). Order Number DE94000301. Source: OSTI; NTIS; GPO Dep.

Lawrence Livermore National Laboratory (LLNL) is a US Department of Energy (DOE)' research and development (R&D) facility operated by the University of California. The R&D activities conducted at LLNL require the use of a wide variety of chemicals which are purchased in sufficient quantities to ensure that the necessary supply is on-hand to meet programmatic schedules and commitments. Purchasing control measures minimize excess inventories of unused chemicals, but small quantities of opened and unopened surplus chemicals still remain at the conclusion of research activities. Drum quantities of surplus chemicals also can be generated if a programmatic activity is abruptly terminated because of loss of funding. A real-time system was needed to route unused surplus chemicals to new experiments and programs instead of to waste treatment and disposal facilities. Representatives from four LLNL organizations (Lasers, Defense Systems/Nuclear Design, Chemistry, and Business Services) combined their skills and ideas to develop and implement an on-li ne surplus chemical exchange system for use at LLNL. An electronic surplus chemical bulletin board, referred to. as the "LLNL Chemical Exchange Data Base," is the product of the group's efforts.

9904 Law

2892 (INIS-mf–13727) **Atomic Energy Commission Act, 1963.** Ghana. 1963. 10p. Order Number DE94604693. Source: OSTI; NTIS (US Sales Only); INIS.

Act 204.

Promulgated in 1963, the Atomic Energy Commission Act (204) established and vested in the Ghana Atomic Energy Commission the sole responsibility for all matters relating to the peaceful uses of atomic energy in the country. Embodied in the Act are provisions relating to the powers, duties, rights and liabilities of the Commission. (EAA).

2893 (INIS-mf–13728) **Atomic Energy Commission (Amendment) Law, 1993.** Ghana. Feb 1993. 1p. Order Number DE94604694. Source: OSTI; NTIS (US Sales Only); INIS.

P.N.D.C. Law 308.

The Atomic Energy Commission (Amendment) Law, 1993 (P.N.D.C.L. 308) seeks to amend the Atomic Energy Commission Act of 1963 (Act 204) so as to provide for the establishment of a Radiation Protection Board and other institutes under the Ghana Atomic Energy Commission. The Law further repeats the Atomic Energy Commission (Amendment) Law of 1982 (P.N.D.C.L. 37). (EAA).

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Economic impacts of oil spills: Spill unit costs for tankers, pipelines, refineries, and offshore facilities: [Task 1, Final report], 19:87 (R;US)

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AN SSSR, Makhachkala (Russian Federation). Fizicheskij Inst.
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AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.
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AN SSSR, Moscow (Russian Federation). Inst. Kristallografii
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AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.
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AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij
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Delaware Univ., Newark, DE (United States). Center for Catalytic Science and Technology
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Delaware Univ., Newark, DE (United States). Inst. of Energy Conversion
Polycrystalline thin film materials and devices: Final subcontract report, 16 January 1990–15 January 1993, 19:564 (R;US)

Department of Atomic Energy, Bombay (India)
DAE symposium on nuclear physics (held at Bombay during December 26-30, 1991) : Contributed papers. Vol. 34B, 19:2419 (I;IN)

Department of Atomic Energy, Bombay (India). Board of Research in Nuclear Sciences
Proceedings of the international symposium on uranium techology [held at Bombay during 13-15 Dec 1989]. V. 1, 19:165 (I;IN)
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Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States)
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Savannah River Plant, 200 Area, Canyon evaporator reboiler, Materials Engineering, Comparison of Hanford and Savannah river tubing, 19:1048 (R;US)
Savannah River Plant, 200 Areas, Materials Engineering, Stainless steel fabrication discussion, May 6, 1959, 19:222 (R;US)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Lab.
Cooling of control rods in the Savannah River reactors: Progress report No. 2, 19:752 (R;US)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant
Copy of notes from Faulds to file on shipping meeting, "C" Line, January 6, 1953, Louviers, 19:229 (R;US)
PID – SRP – solid radioactive waste incineration – W.R. 860575: Report on visit to Rocky Flats and Los Alamos, 19:337 (R;US)

Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States)
EWR 860575 – AFCT – Design integration study: Visit Rocky Flats and LASL sites for design data on incinerators of solid radioactive waste, 19:338 (R;US)

Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept.
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Project 981081: Savannah River Plant, 200 Area, Building 221H, materials engineering, dissolver columns, extra charges by sun ship, 19:205 (R;US)
W.R. 850517-10, Savannah River Plant, Stainless Steel Development Program, Materials Engineering, 309S Cb seamless tubing from Union Steel, 19:1049 (R;US)

Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept.
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East Anglia Univ., Norwich (United Kingdom). Environmental Risk Assessment Unit (ERAU)
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Ecole Nationale Superieure des Arts et Metiers, 33 - Talence (France). Lab. Energetique et Phenomenes de Transfert
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Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP)
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Edinburgh Univ. (United Kingdom). Fluid Dynamics Unit
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EG and G Idaho, Inc., Idaho Falls, ID (United States)
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EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant
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Elforsk AB, Stockholm (Sweden)
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ENEA, Casaccia (Italy). Area Energetica
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ENEA, Saluggia (Italy). Centro Ricerche Energia
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Energy Conservation Center, Tokyo (Japan)
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Energy Research Corp., Danbury, CT (United States)
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Engineering-Science, Inc., Atlanta, GA (United States)
340 Facility compliance assessment, 19:308 (R;US)

Environmental Protection Agency, Las Vegas, NV (United States). Environmental Monitoring Systems Lab.
Offsite environmental monitoring report: Radiation monitoring around United States nuclear test areas, calendar year 1991, 19:1907 (R;US)

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Farmer (I.W.) and Partners Ltd., Newcastle upon Tyne (United Kingdom)
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Fawley Aquatic Research Labs. Ltd. (United Kingdom)
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FEC Energy and Environmental Services, Oldham (United Kingdom)
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Fermi National Accelerator Lab., Batavia, IL (United States)
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Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)
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Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project
Sitewide soil and debris management program for a DOE site under remediation, 19:429 (R;US)

Final Waste Forms Working Group, Washington, DC (United States)
Technical area status report for low-level mixed waste final waste forms: Volume 1, 19:252 (R;US)

Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland)
Magnetic resonance imaging equipments: Their use and safety in Finland 1993, 19:2159 (R;FI;In Finnish)
Monitoring of radionuclides in the Baltic Sea in 1989-1990: Supplemet 10 to Annual Report STUK-A–89, 19:2117 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 3rd quarter, 1992, 19:688 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1992 and annual summary, 19:689 (R;FI)
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Finnish Pulp and Paper Research Inst., Espoo (Finland)
Energy and quality optimization of pigment coating drying: Final report, 19:944 (R;FI;In Swedish)
Energy efficient use of infrared dryers in paper industry: Final report, 19:943 (R;FI;In Finnish, English)
KUITU - Energy-efficient mechanical pulping: Final report on the energy research programme 1988-1992, 19:947 (R;FI;In Finnish)
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Vacuum system and ventilation of the dryer section: Final report, 19:940 (R;FI;In Finnish)

Florida State Univ., Tallahassee, FL (United States)
An analytical method for estimating the ^{14}N nuclear quadrupole resonance parameters of organic compounds with complex free induction decays for radiation effects studies, 19:2196 (R;US)

Florida State Univ., Tallahassee, FL (United States). Dept. of Physics
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Florida Univ., Gainesville, FL (United States)
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FORCE Insts., Copenhagen (Denmark)
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Forest of Mercia, Cannock (United Kingdom)
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Forestry Commission, Farnham (United Kingdom). Research Div.
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Foster Wheeler Development Corp., Livingston, NJ (United States)
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Gas Research Inst., Chicago, IL (United States)
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General Electric Co., Schenectady, NY (United States). Corporate Research and Development Dept.
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General Electric Environmental Services, Inc., Lebanon, PA (United States)
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Geological Survey, Denver, CO (United States)
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Geological Survey, Menlo Park, CA (United States)
Annotated bibliography hydrogeology of Kilauea Volcano, Hawaii, 19:2255 (R;US)

Georgia Inst. of Tech., Atlanta, GA (United States). Georgia Technology Research Inst.
Development of silicon nitride composites with continuous fiber reinforcement, 19:1130 (R;US)

Georgia Inst. of Tech., Atlanta, GA (United States). School of Material Engineering
Thin-wall hollow ceramic spheres from slurries: Quarterly project status report, 1 January–31 March 1991, 19:1082 (R;US)

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Radiation protection instrument 1993, 19:488 (I;GH)

Gilbert/Commonwealth, Inc., Reading, PA (United States)
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Clean coal reference plants: Atmospheric CFB: Topical report, Task 1, 19:650 (R;US)

Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation)
Nuclear and physical investigations, 19:2421 (R;RU;In Russian)

Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki
Elementary particles. Issue 2, 19:2329 (I;RU;In Russian)

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Indian Nuclear Society, Bombay (India)
Proceedings of the Indo-Japan seminar on thorium utilization (held at Bombay during December 10-13, 1990), 19:726 (I;IN)

Indiana Univ., Bloomington, IN (United States). Dept. of Physics
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Indira Gandhi Centre for Atomic Research, Kalpakkam (India)
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Inhalation Toxicology Research Inst., Albuquerque, NM (United States)
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Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Chemical Engineering
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Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering
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Lund Univ. (Sweden). Dept of Building Technology
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Martin Marietta Astro Space, Philadelphia, PA (United States)
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Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)
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Martin Marietta Energy Systems, Inc., Piketon, OH (United States)
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Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Nuclear Engineering
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Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center
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Mine Safety and Health Administration, Denver, CO (United States). Safety and Health Technology Center
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Mine Safety and Health Administration, Pittsburgh, PA (United States). Pittsburgh Health Technology Center
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Ministere de l'Energie et des Mines, Rabat (Morocco). Direction de l'Energie
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Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.
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Minnesota Univ., Minneapolis, MN (United States). Corrosion Research Center
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Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering
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Mission Research Corp., Los Alamos, NM (United States)
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Mississippi Univ., University, MS (United States). Dept. of Biology
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National Academy of Sciences, Washington, DC (United States)
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National Aeronautics and Space Administration, Cleveland, OH (United States). Lewis Research Center
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National Inst. for Fusion Science, Nagoya (Japan)
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National Inst. of Standards and Technology (EEEL), Gaithersburg, MD (United States). Electricity Div.
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National Inst. of Standards and Technology, Boulder, CO (United States). Thermophysics Div.
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National Power, Leatherhead (United Kingdom). Technology and Environment Centre
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New Mexico Inst. of Mining and Technology, Socorro, NM (United States). New Mexico Petroleum Recovery Research Center
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New Mexico State Univ., Las Cruces, NM (United States). Dept. of Physics
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New Mexico Univ., Albuquerque, NM (United States). Dept. of Physics and Astronomy
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New York State Dept. of State, Albany, NY (United States)
Attic ventilation and air sealing: A technical review of the issues: Final report, 19:909 (R;US)

New York State Energy Research and Development Authority, Albany, NY (United States)
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Nissan Motor Co. Ltd., Tokyo (Japan)
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Nordisk Ministerraad
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Initiatives to tackle environmental problems caused by intercommunicating traffic systems in the Nordic countries: Partial report no. 2, 19:1948 (RA;DK;In Norwegian)

Norges Forskningsraad, Oslo (Norway). Avd. NAVF
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International global atmospheric chemistry (IGAC) program global emissions inventory activity (GEIA): Proceedings of the IGAC/GEIA workshop on global emission inventory, 19:1952 (R;NO)
Measurement of radioactivity in Norway: Annual report 1991, 19:2227 (R;NO;In Norwegian)

North American Weather Consultants, Salt Lake City, UT (United States)
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North Carolina State Univ., Raleigh, NC (United States)
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Northern Power Systems, Moretown, VT (United States)
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services
Title list of documents made publicly available, August 1–31, 1993: Volume 15, No. 8, 19:723 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Low-Level Waste Management and Decommissioning
Site decommissioning management plan, 19:287 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Reactor Controls and Human Factors
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications
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Spherical diffusion of tritium from a point of release in a uniform unsaturated soil: A deterministic model for tritium migration in an arid disposal site, 19:2076 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Safety and Analysis
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Nuclear Regulatory Commission, Washington, DC (United States). Office for Analysis and Evaluation of Operational Data
Report to Congress on abnormal occurrences, April–June 1993: Volume 16, No. 2, 19:785 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Office of Information Resources Management
Radioactive materials released from nuclear power plants: Volume 11: Annual report, 1990, 19:758 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Reactor Regulation
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Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research
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Oregon Graduate Center, Beaverton, OR (United States)
[Fundamental studies in oxidation-reduction in relation to water photolysis]: Progress report, June 26, 1989–November 1, 1990, 19:1275 (R;US)

Oregon Univ., Eugene, OR (United States). Inst. of Molecular Biology
Transposon-induced nuclear mutations that alter chloroplast gene expression: Annual report, September 1, 1992–April 15, 1993, 19:2130 (R;US)

Oslo Univ. (Norway). Fysisk Inst.
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Targetry '91: Proceedings of the 4. international workshop on targetry and target chemistry, 19:1303 (R;CH)

Pennsylvania State Univ., University Park, PA (United States)
[Determination of the distribution of hydrogen in coal by FTIR]: [Annual report, May 31, 1987–April 30, 1988], 19:30 (R;US)
[Determination of the distribution of hydrogen in coal by FTIR]: Technical progress report, [May 31, 1990–April 20, 1991], 19:31 (R;US)
[Scanning tunnelling microscopy and spectroscopy of ceramic grain boundaries]: [Annual report, September 1992–September 1993], 19:1083 (R;US)

Pittsburgh Univ., PA (United States)
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Polytechnic Univ., Brooklyn, NY (United States)
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Pontificia Univ. Catolica del Peru, Lima (Peru). Facultad de Ciencias e Ingenieria
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Powers (Dennis W.), Anthony, TX (United States)
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Princeton Univ., NJ (United States). Dept. of Mechanical and Aerospace Engineering
[Mechanism and enhancement of flame stabilization]: [Annual report, 1993–1994], 19:1368 (R;US)

Princeton Univ., NJ (United States). Plasma Physics Lab.
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Public Technology, Inc., Washington, DC (United States)
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Purdue Research Foundation, Lafayette, IN (United States)
[The study of hadronic matter at the highest energy density: The search for the deconfined quark-gluon phase using 2 TeV p-p collisions]: Progress report, 19:2357 (R;US)

Purdue Univ., Lafayette, IN (United States). Dept. of Chemistry
Fundamental studies of reactive intermediates in homogeneous catalysis, 19:1248 (R;US)

Purdue Univ., Lafayette, IN (United States). School of Nuclear Engineering
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Pyropower Corp., San Diego, CA (United States)
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Science Applications International Corp., Idaho Falls, ID (United States)
Technical area status report for low-level mixed waste final waste forms: Volume 1, 19:252 (R;US)

Science Applications International Corp., Las Vegas, NV (United States)
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Science Applications International Corp., McLean, VA (United States)
Military and diplomatic roles and options for managing and responding to the proliferation of ballistic missiles and weapons of mass destruction: Final report: Program on Stability and the Offense/Defense Relationship, 19:981 (R;US)

Science Applications International Corp., Oak Ridge, TN (United States)
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Stanford Univ., CA (United States). Dept. of Geophysics
Integrated seismic study of naturally fractured tight gas reservoirs: Technical progress report, January 1, 1993–March 31, 1993, 19:99 (R;US)

Stanford Univ., CA (United States). High Temperature Gasdynamics Lab.
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Surface/Interface, Inc., Mountain View, CA (United States)
Charge distribution analysis of catalysts under simulated reaction conditions: Third quarterly technical progress report, March 31–June 30, 1993, 19:1250 (R;US)

Surtek, Inc., Golden, CO (United States)
Investigation of oil recovery improvement by coupling an interfacial tension agent and a mobility control agent in light oil reservoirs: Technical progress report, April–June 1993, 19:74 (R;US)

Swedish Council for Building Research, Stockholm (Sweden)
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Swedish Environmental Protection Agency, Solna (Sweden)
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Swedish Environmental Research Inst., Goeteborg (Sweden)
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Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden)
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Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden)
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Swedish Nuclear Power Inspectorate, Stockholm (Sweden)
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Swedish Transport Research Board, Stockholm (Sweden)
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Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Forest Soils
Litter mass-loss rates in late stages of decomposition at some climatically and nutritionally different pine sites, a study on the effects of climate change, 19:520 (R;SE)

Synertech Systems Corp., Syracuse, NY (United States)
Attic ventilation and air sealing: A technical review of the issues: Final report, 19:909 (R;US)

Syracuse Univ., NY (United States). Dept. of Civil and Environmental Engineering
Reduced gas pressure operation of sludge digesters: Expanded studies: Final report, 19:959 (R;US)

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Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Mechanical Engineering
Enhanced absorption cycle computer model: Final report, 19:2866 (R;US)

Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik
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Technology and Management Services, Inc., Gaithersburg, MD (United States)
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Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry
Capillary electrokinetic separations with optical detection: Technical progress report, February 1, 1993–January 31, 1994, 19:1155 (R;US)

Tennessee Univ., Knoxville, TN (United States). Dept. of Physics
Symmetry-dictated trucation: Solutions of the spherical shell model for heavy nuclei, 19:2304 (R;US)

Tennessee Valley Authority, Chattanooga, TN (United States)
A comparison of methods to evaluate reservoir dissolved oxygen data: Average cross-sectional area versus time X depth integration's, 19:2119 (R;US)
Biomonitoring of fish communities, using the index of Biotic Integrity, as an indicator of the success of soil conservation measures in the Rabbit Creek and Middle Creek watersheds, Macon County, North Carolina, 19:2121 (R;US)
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Texas A and M Univ., College Station, TX (United States)
Radiative heat transfer in porous uranium dioxide, 19:178 (R;US)

Texas A and M Univ., College Station, TX (United States). Dept. of Mechanical Engineering
Combustion of dense streams of coal particles: Quarterly progress report No. 11, February 29, 1993–May 28, 1993, 19:58 (R;US)

Texas Univ., Arlington, TX (United States). Dept. of Geology
Isotopic and trace element characteristics of rhyolites from the Valles Caldera, New Mexico: Final technical report, 19:2252 (R;US)

Texas Univ., Austin, TX (United States)
STAR electromagnetic calorimeter R&D progress report, 1 October 1992–31 August 1993, 19:1606 (R;US)

Texas Univ., Austin, TX (United States). Inst. for Fusion Studies
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Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study
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Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.
Annual report of Nuclear Engineering Research Laboratory, University of Tokyo in fiscal 1992, 19:2818 (R;JP;In Japanese)
Report of the research results with University of Tokyo, Nuclear Engineering Research laboratory's Facilities in fiscal 1992, 19:2819 (R;JP;In Japanese)

Toledo Univ., OH (United States). Dept. of Physics and Astronomy
Semiempirical studies of atomic structure: Progress report, 1 July 1991–1 October 1993, 19:2530 (R;US)

Toyota Motor Co. Ltd., Aichi (Japan)
Energy conservation by means of the utilization of industrial waste as fuel, 19:928 (IA;JP)

Trondheim Univ. (Norway). Inst. for Fysikk
Limits on supersymmetry masses from the anomalous magnetic moment of leptons, 19:2351 (R;NO)
Relativistic formionium production by electrons in a crystal, 19:2561 (R;NO)

TRW, Inc., Redondo Beach, CA (United States). Applied Technology Div.
MHD seed recovery/regeneration: Phase 2, Technical progress report, quarter ending May 1993, 19:875 (R;US)

Tuskegee Univ., AL (United States). Dept. of Chemical Engineering
Liquid chromatographic analysis of coal surface properties: Quarterly progress report, April–June 1993, 19:34 (R;US)
Liquid chromatographic analysis of coal surface properties: Quarterly progress report, July–September 1993, 19:35 (R;US)

U

UNESP, Araraquara, SP (Brazil). Inst. de Quimica
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Union Carbide Chemicals and Plastics Co., Inc., South Charleston, WV (United States). South Charleston Technical Center
Heterogeneous catalytic process for alcohol fuels from syngas: Fifth quarterly technical progress report, January–March, 1993, 19:546 (R;US)

United Nations Development Programme
Agricultural production - Phase 2. Indonesia. Controlled release pesticide formulations: Technical report. Report prepared for the Government of the Republic of Indonesia, 19:2171 (R;XA)

United Nuclear Industries, Inc., Richland, WA (United States)
Annual report of N Reactor operating experience pertinent to nuclear safety – CY-1973, 19:773 (R;US)

Universidad Autonoma del Estado de Mexico, Toluca (Mexico). Facultad de Quimica
Nuclear reaction of ^{10} B (n, α) ^{7} Li and grain size effects on the production of free radicals in alanine., 19:1639 (I;MX;In Spanish)
Study of iron exchanged zeolites by Moessbauer effect and electron spin resonance spectroscopy., 19:1251 (I;MX;In Spanish)

Universidad Autonoma Metropolitana, Mexico City (Mexico). Unidad Azcapotzalco
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Heat convection in a set of three vertical cylinders., 19:1424 (I;MX;In Spanish)

Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Ciencias
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Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Ciencias Politicas y Sociales
The problem of nuclear wastes. A possible point of conflict between Mexico and the United States., 19:270 (I;MX;In Spanish)

Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Facultad de Quimica
Electrodeposition of bismuth alloys by the controlled potential method., 19:1008 (I;MX;In Spanish)

University of Southern California, Los Angeles, CA (United States). Computer Research Inst.
Macro-actor execution on multilevel data-driven architectures, 19:2830 (R;US)
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University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering
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University of Southern Mississippi, Hattiesburg, MS (United States)
Mississippi graduate trainee project for DOE EPSCoR: Summary report for year No. 2, 19:2804 (R;US)

University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst.
Treatment of produced waters by electrocoagulation and reverse osmosis, 19:90 (R;US)

URS/John A. Blume and Associates, Engineers, San Francisco, CA (United States)
Seismic Safety Program: Ground motion and structural response, 19:1860 (R;US)

USAEC Hanford Operations Office, Richland, WA (United States)
Events of importance for week ending June 29, 1949, Hanford Operations Office, Richland, Washington, 19:765 (R;US)

USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office
Environmental assessment of remedial action at the Slick Rock uranium mill tailings sites Slick Rock, Colorado: Draft, 19:407 (R;US)
Environmental assessment of remedial action at the Naturita Uranium processing site near Naturita, Colorado: Revision 1, 19:408 (R;US)
Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, 19:398 (R;US)

USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Building Equipment Div.
Bibliography of the DOE Building Equipment Research Program, 19:903 (R;US)

USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Geothermal Div.
Proceedings: "Geothermal Energy: The Environmental Responsible Energy Technology for the Nineties": Geothermal Program Review 11, 19:588 (R;US)

USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC (United States). Office of Transportation Technologies
Electric and Hybrid Vehicles Program: Sixteenth annual report to Congress for fiscal year 1992, 19:972 (R;US)

USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Office of Transportation Technologies
Federal Alternative Fuel Program Light Duty Vehicle Operations: Second annual report to Congress for fiscal year 1992, 19:977 (R;US)

USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States)
Environment, Safety and Health progress assessment of the Idaho National Engineering Laboratory (INEL), 19:1888 (R;US)

USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Audit
Environmental Management Assessment of the Superconducting Super Collider (SSC), 19:2607 (R;US)

USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Strategic Petroleum Reserve
Strategic Petroleum Reserve quarterly report, 19:94 (R;US)

USDOE Bartlesville Project Office, OK (United States)
Contracts for field projects and supporting research on enhanced oil recovery, July–September 1992: Progress review No. 72, quarter ending September 30, 1992, 19:71 (R;US)

USDOE Bonneville Power Administration, Portland, OR (United States)
Bonneville purchasing instructions, Post-award guide for service contracts: Appendix 14A: Contracting Officer's Technical Representatives' guide for services contracts, 19:2801 (R;US)
Draft Environmental Impact Statement: Proposed Tenaska, Washington II Generation Project, 19:671 (R;US)
Irrigation depletions 1928–1989: 1990 level of irrigation, Snake Yakima and Deschutes River Basins, 19:547 (R;US)
Modified streamflows 1990 level of irrigation: Columbia River and coastal basins, 1928–1989, 19:548 (R;US)
Non-Federal participation in AC Intertie: Draft Environmental Impact Statement, 19:810 (R;US)

USDOE Bonneville Power Administration, Portland, OR (United States). Div. of Fish and Wildlife
Integrated hatchery operations team: Operation plans for anadromous fish production facilities in the Columbia River Basin: Volume 4 addendum: Rocky Reach Hatchery, Annual report 1992, 19:551 (R;US)

USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 10, Selected crosstabulations for states served by Bonneville: Volume Z, Washington; Volume AA, Oregon; Volume AB, Idaho; Volume AC, Western Montana, 19:900 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 11, Selected crosstabulations for types of Pacific Northwest utilities: Volume AD, Public generating; Volume AE, Public non-generating; Volume AF, Investor-owned, 19:901 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 12, Non-respondent survey: Volume AG, Study of non-respondents, 19:902 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 2, Item-by-item crosstabulations: Volume C, Pacific Northwest Region, 19:892 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 3, Item-by-item crosstabulations: Volume D, Bonneville Area Offices, 19:893 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 4, Item-by-item crosstabulations: Volume E, Pacific Northwest states, 19:894 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 5, Selected crosstabulations: Volume F, Pacific Northwest Region, 19:895 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 6, Selected crosstabulations for publicly-owned generating utilities: Volume G, Eastern Washington; Volume H, Western Washington; Volume I, Western Oregon, 19:896 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 7, Selected crosstabulations for publicly-owned non-generating utilities: Volume J, Western Montana; Volume K, Idaho; Volume L, Eastern Washington; Volume M, Western Washington; Volume N, Eastern Oregon; Volume O, Western Oregon, 19:897 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 8, Selected crosstabulations for investor-owned utilities: Volume P, Western Montana; Volume Q, Idaho; Volume R, Eastern Washington; Volume S, Western Washington; Volume T, Eastern Oregon; Volume U, Western Oregon, 19:898 (R;US)
The 1992 Pacific Northwest Residential Energy Survey: Phase 1 (PNWRES92-I): Book 9, Selected crosstabulations for BPA's Area Offices: Volume V, Puget Sound – Seattle; Volume W,

Lower Columbia – Portland; Volume X, Upper Columbia – Spokane; Volume Y, Snake River – Walla Walla, 19:899 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels
Electric power monthly, July 1993, 19:869 (R;US)
Model documentation report: Short-Term Hydroelectric Generation Model, 19:550 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use
International petroleum statistics report, 19:83 (R;US)
International petroleum statistics report, September 1993, 19:84 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas
Natural gas monthly, September 1993, 19:133 (R;US)
Petroleum marketing monthly, October 1993, 19:82 (R;US)
US production of natural gas from tight reservoirs, 19:134 (R;US)
Winter fuels report, week ending October 8, 1993, 19:85 (R;US)
Winter fuels report, week ending October 15, 1993, 19:86 (R;US)

USDOE Morgantown Energy Technology Center, WV (United States)
Effects of operating conditions on dust cake behavior in filters with high surface-to-volume ratios, 19:668 (R;US)
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Pressurized burner test facility, 19:159 (R;US)
The role of IGCC in USDOE clean coal research, development and demonstration, 19:57 (R;US)
The systems and the developmental targets for PFBC, 19:56 (R;US)

USDOE Nevada Operations Office, Las Vegas, NV (United States). Office of External Affairs
Announced United States nuclear tests, July 1945–December 1992: Revision 13, 19:1859 (R;US)

USDOE Oak Ridge Field Office, TN (United States)
Environmental restoration and waste management Site-Specific Plan for the Oak Ridge Reservation: FY 1993, 19:1988 (R;US)
Responses to comments on the remedial investigation/feasibility study-environmental impact statement for remedial action at the Chemical Plant area of the Weldon Spring site (November 1992), 19:412 (R;US)

USDOE Oak Ridge Operations Office, TN (United States)
Risk characterization data manual for Category D inactive liquid low-level waste tank systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 19:416 (R;US)

USDOE Office of Energy Research, Washington, DC (United States)
A report of the Basic Energy Sciences Advisory Committee: 1992 review of the Basic Energy Sciences Program of the Department of Energy, 19:2803 (R;US)

USDOE Office of Energy Research, Washington, DC (United States). Office of Field Operations Management
Report of the DOE Review Committee on the baseline validation of the Superconducting Super Collider, 19:1475 (R;US)

USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States)
Divison of Environmental Education and Development Fiscal Year 1992 annual report, 19:2802 (R;US)
EM International: Volume 1, 19:246 (R;US)

USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development
Technical area status report for low-level mixed waste final waste forms: Volume 1, 19:252 (R;US)

USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office
The remedial investigation/feasibility study process at Oak Ridge National Laboratory, 19:413 (R;US)

USDOE Office of Inspector General, Washington, DC (United States). Office of Inspections
Inspection of the Department of Energy's procedures for administering contractors' executive employees' compensation, 19:2799 (R;US)

USDOE Richland Field Office, WA (United States)
Hanford Site baseline risk assessment methodology: Revision 2, 19:421 (R;US)

USDOE Richland Operations Office, WA (United States)
Hanford 200 Areas Development Plan, 19:1982 (R;US)
Hanford past-practice strategy, 19:420 (R;US)
Phase 1 remedial investigation report for 200-BP-1 operable unit: Volume 1, 19:422 (R;US)
Sodium dichromate expedited response action assessment, 19:424 (R;US)
Treatability test plan for the 200-BP-1 prototype surface barrier, 19:423 (R;US)
Waste analysis plan for confirmation or completion of Tank Farms backlog waste designation, 19:258 (R;US)
White Bluffs Pickling Acid Cribs expedited response action proposal, 19:257 (R;US)

USDOE Savannah River Operations Office, Aiken, SC (United States)
Construction of the Savannah River Ecology Laboratory Conference Center: Environmental Assessment, 19:1978 (R;US)

USDOE Western Area Power Administration, Sacramento, CA (United States). Sacramento Area Office
Revised Environmental Assessment for the Sacramento Area Office Western Area Power Administration, 1994 Power Marketing Plan, 19:552 (R;US)
Revised Environmental Assessment for the Sacramento Area Office Western Area Power Administration, 1994 Power Marketing Plan: Appendices, 19:549 (R;US)

USDOE, Washington, DC (United States)
A 1990s commissioner views the role of long-term contracts in utility gas procurement, 19:112 (RA;US)
A third-party summary of ARTA views on LDC gas-procurement and its regulatory surveillance, 19:111 (RA;US)
Acting assistant secretary for policy Department of Energy, 19:105 (RA;US)
Balancing competition and regulation in the 90s, 19:113 (RA;US)
Bill Shane's bullets, 19:146 (RA;US)
BTU energy tax, 19:140 (RA;US)
Capacity options: Independent power producers, pipeline capacity, and state commissions, 19:145 (RA;US)
Clean air: Level the NOX playing field for all fuels, 19:136 (RA;US)
Commercial gas cooling market, 19:108 (RA;US)
Commercial markets, 19:109 (RA;US)
Department of Energy standards index: Revision 1, 19:2805 (R;US)
Deregulatory dynamics: Bypass and reckoning in the California gas market, 19:151 (RA;US)
Designing purchased gas adjustment clauses to provide for incentive compatibility in a more competitive environment, 19:128 (RA;US)
DOE/NARUC - National conference on natural gas use, 19:137 (RA;US)
DOE/NARUC national conference on natural gas use, 19:119 (RA;US)
DOE/NARUC national conference on natural gas use, 19:121 (RA;US)
DOE/NARUC national conference on natural gas use, 19:122 (RA;US)
Draft report: Status of petroleum production industry in California: The cost of regulatory compliance, 19:148 (RA;US)
Environmental assessment of the brine pipeline replacement for the Strategic Petroleum Reserve Bryan Mound Facility in Brazoria County, Texas, 19:91 (R;US)
Finding of no significant impact for the interim action for cleanup of Pit 9 at the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, 19:410 (R;US)

First interim report of the Federal Fleet Conversion Task Force, 19:978 (R;US)
Fundamentals of utility gas-acqusition strategy for the 1990s (in 600 words or less), 19:110 (RA;US)
Government natural gas vehicle initiatives: Paving the way, 19:117 (RA;US)
Industrial markets: Trying to adapt to life under order 636, 19:152 (RA;US)
Industrial markets: What your customers really think of the gas industry, 19:131 (RA;US)
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Natural gas distribution costs and efficiency implications for regulation, 19:129 (RA;US)
Natural gas, power generation and order No. 636: Regulatory and commercial issues that must be addressed for the courtship to lead to consummation, 19:154 (RA;US)
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Tank 241-C-103 organic vapor and liquid characterization and supporting activities, Hanford Site, Richland, Washington: Environmental Assessment, 19:411 (R;US)
The law of unintended consequences, 19:141 (RA;US)
The mineral estate and natural gas producer in the post-636/Energy Policy Act Era, 19:147 (RA;US)
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	19:1829	SAND–93-2155C
	19:1836	SAND–93-1673
	19:1837	SAND–93-1965C
	19:1868	SAND–93-2199
	19:1960	SAND–93-0449C
	19:2273	SAND–92-1810
	19:2516	SAND–92-2551C
	19:2564	SAND–93-0887C
	19:2566	SAND–93-1400C
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	19:2611	SAND–93-1060C
	19:2612	SAND–93-1588
	19:2787	SAND–93-1026C
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	19:2817	SAND–93-2292C
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	19:721	SAND–92-7343
	19:1102	SAND–93-1979C
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	19:482	SAND–93-0032
	Lawrence Livermore National Lab., CA (United States)	
	19:2586	UCRL-JC–114718
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research	
	19:795	NUREG/CR–5978
AC04-76DR00789	**Sandia National Labs., Livermore, CA (United States)**	
	19:446	SAND–93-8012
	19:952	SAND–94-8201
	19:1869	SAND–93-8220
AC04-86AL31950	**Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div.**	
	19:259	DOE/WIPP–91-058
	19:260	DOE/WIPP–93-019-Vol.2
	19:261	DOE/WIPP–93-033
	19:487	DOE/AL/31950–T5
AC04-86ID12584	**Oak Ridge National Lab., TN (United States)**	
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	19:512	MLM–3786
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	19:245	DOE/AL/62350–36PF
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	19:400	DOE/AL/62350–43D
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	19:403	DOE/AL/62350–54D
	19:404	DOE/AL/62350–68F
	19:405	DOE/AL/62350–70F
	USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office	
	19:398	DOE/AL/62350–32D
	19:407	DOE/EA–0339
	19:408	DOE/EA–0464-Rev.1
AC04-94AL85000	**Sandia National Labs., Albuquerque, NM (United States)**	
	19:95	SAND–92-2284
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	19:321	SAND–93-2250C
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	19:443	SAND–93-1261C
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	19:1447	SAND–93-0337C
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	19:1867	SAND–93-2156
	19:1961	SAND–93-1296C
	19:2081	SAND–93-7077C
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	19:2568	SAND–93-1422-Vol.2
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	19:1436	SAND–92-7347
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	19:1908	ES/ESH–36
	19:1909	ES/ESH–37
	Science Applications International Corp., Oak Ridge, TN (United States)	
	19:1988	ES/ER/TM–36
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	19:751	DOE/OR/00033–T551
	19:1980	DOE/OR/00033–T567
	19:2195	DOE/OR/00033–T540
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	19:997	CONF-930997–5
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	19:2299	CONF-9210121–
	19:2841	CONF-9310100–3
	Los Alamos National Lab., NM (United States)	
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	19:1165	DOE/OR/00033–T538
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	19:1616	DOE/OR/00033–T571
	19:1979	DOE/OR/00033–T546
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	19:2638	DOE/OR/00033–T545
	19:2740	DOE/OR/00033–T533
AC05-84ER40150	**New Mexico State Univ., Las Cruces, NM (United States). Dept. of Physics**	
	19:2380	DOE/ER/40150–236
	Continuous Electron Beam Accelerator Facility, Newport News, VA (United States)	
	19:1490	DOE/ER/40150–232
	19:2405	DOE/ER/40150–238
	Southeastern Universities Research Association, Inc., Newport News, VA (United States). Continuous Electron Beam Accelerator Facility	
	19:1525	DOE/ER/40150–213
	19:1526	DOE/ER/40150–215
	19:1527	DOE/ER/40150–234
	19:1588	DOE/ER/40150–229
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	19:29	CONF-930904–11
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	19:244	CONF-931095–44
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	19:292	ORNL/TM–11824
	19:293	ORNL/TM–12063
	19:427	ES/ER/TM–92
	19:431	ORNL–6762
	19:432	ORNL/ER–180
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	19:434	ORNL/TM–12259
	19:435	ORNL/TM–12368
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	19:516	CONF-930304–32
	19:553	ORNL/TM–12493
	19:713	CONF-930913–44
	19:739	ORNL/TM–12296
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	19:760	CONF-9306234–1
	19:761	CONF-9310102–32
	19:777	CONF-931079–6
	19:778	CONF-9310102–18
	19:779	CONF-931160–18
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	19:798	ORNL/TM–12382
	19:825	CONF-9310145–2
	19:870	ORNL/CON–372
	19:979	ORNL–6771
	19:998	CONF-930997–6
	19:1037	ORNL/TM–12200
	19:1079	CONF-9304191–3
	19:1080	CONF-9308122–8
	19:1081	CONF-9308122–9
	19:1100	ORNL/TM–12423
	19:1116	CONF-9308122–6
	19:1219	ORNL/TM–12403
	19:1374	CONF-930403–54
	19:1375	CONF-930907–13
	19:1376	CONF-9310102–21
	19:1377	CONF-9311107–1
	19:1419	CONF-930675–7
	19:1473	CONF-930511–485
	19:1474	CONF-931160–22
	19:1812	CONF-9309199–5
	19:1813	ORNL/TM–12383
	19:1819	CONF-930796–4
	19:1846	ORNL/TM–12405
	19:1847	ORNL/TM–12434
	19:1866	ORNL/TM–12478
	19:1876	CONF-930722–50
	19:1903	CONF-930796–5
	19:1955	ORNL/TM–12452
	19:1977	CONF-9310205–1
	19:2077	ORNL/ER–143
	19:2139	ORNL–6757
	19:2141	CONF-9302119–2

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	19:2193	CONF-9106235–7
	19:2229	ORNL/TM–12433
	19:2244	CONF-9301129–1
	19:2250	CONF-9309230–2
	19:2251	CONF-9310102–17
	19:2281	CONF-931115–12
	19:2425	CONF-9210121–8
	19:2461	CONF-930169–4
	19:2551	CONF-930711–4
	19:2590	CONF-930711–1
	19:2601	CONF-9302137–2
	19:2602	CONF-9304191–2
	19:2603	CONF-9304191–4
	19:2604	CONF-930703–34
	19:2605	CONF-930703–35
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	19:2620	CONF-9305210–4
	19:2621	CONF-9305210–5
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	19:2708	ORNL/TM–12424
	19:2736	CONF-9305210–2
	19:2838	CONF-9305285–1
	19:2839	CONF-9308176–1
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	19:2867	ORNL/TM–12285
	19:2868	ORNL/TM–12404
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	19:2886	ORNL/TM–12419
	19:227	DOE/OR–01-1167-D1
	19:290	ORNL/ER/Sub–87-99053/69
	19:430	KY/ER–11
	19:996	CONF-930809–10
	19:997	CONF-930997–5
	19:1036	ORNL/Sub–88-SB775/03
	19:1099	ORNL/Sub–86-SE793C
	19:1130	ORNL/Sub–87-00184/04
	19:1286	CONF-930907–12
	19:1818	CONF-930405–40
	19:1835	ORNL/SUB–93-SL161
	19:2299	CONF-9210121–
	19:2304	CONF-9209239–8
	19:2841	CONF-9310100–3
	19:2866	ORNL/Sub–91-SH641/1
Princeton Univ., NJ (United States). Plasma Physics Lab.		
	19:2779	PPPL-CFP–2965
Oak Ridge Y-12 Plant, TN (United States)		
	19:486	Y/MA–37-7212
	19:1408	Y/DV–1273
USDOE Oak Ridge Operations Office, TN (United States)		
	19:416	DOE/OR–01-1168-D2
Lawrence Livermore National Lab., CA (United States)		
	19:1256	UCRL-JC–114161
Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering		
	19:707	NUREG/CR–5968
	19:708	NUREG/CR–6071
	19:736	NUREG/CP–0131
Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)		
	19:381	ES/ESH–31/V1
	19:382	ES/ESH–31/V2
	19:425	ES/ER/TM–90
	19:426	ES/ER/TM–91
	19:849	CONF-9308180–2
	19:415	DOE/OR–01-1117/V1
	19:1908	ES/ESH–36
	19:1909	ES/ESH–37
Science Applications International Corp., Oak Ridge, TN (United States)		
	19:1988	ES/ER/TM–36
Oak Ridge National Lab., TN (United States). Carbon Dioxide Information Analysis Center		
	19:1954	ORNL/CDIAC–34/R3
General Atomics, San Diego, CA (United States)		
	19:2741	GA-A–21349
	19:2743	GA-A–21396
USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development		
	19:252	DOE/MWIP–3-Vol.1
AC05-84OS21400	**Oak Ridge National Lab., TN (United States)**	
	19:1841	CONF-9306110–2
Oak Ridge Y-12 Plant, TN (United States)		
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	19:1258	Y/DV–1268
	19:1407	Y/DD–613
	19:1409	Y/LF–456/R1
	19:1430	Y/MA–7206
	19:414	DOE/OR–01-1115-D2
	19:473	Y/SUB–92-YP507C/3/P1
	19:2103	Y/TS–1016
AC05-84OT21400	**Oak Ridge K-25 Site, TN (United States)**	
	19:1369	K/CSD/TM–93-Rev.2
AC05-86OR21548	**USDOE Oak Ridge Field Office, TN (United States)**	
	19:412	DOE/EIS–0185F
AC05-86OR21607	**Oak Ridge Research Inst., TN (United States)**	
	19:418	DOE/OR/21607–T6
	19:1981	DOE/OR/21607–T7
	19:2197	DOE/OR/21607–2
AC05-92OR21972	**Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project**	
	19:429	FEMP/SUB–064
Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)		
	19:264	FEMP–2307
	19:428	FEMP–2306
AC06-76RL01830	**Brookhaven National Lab., Upton, NY (United States)**	
	19:1899	BNL–49530
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	19:179	HW–3-1812
	19:384	HW–24800-97
	19:475	HW–45511
	19:766	HW–7-991-Del.
	19:767	HW–10307
	19:768	HW–10339
Isochem Inc., Richland, WA (United States)		
	19:271	ISO–100
General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation		
	19:180	HW–45119
	19:181	HW–55283
	19:182	HW–57225
	19:183	HW–61570-Del.
	19:212	HW–46396

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	19:214	HW–52740
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	19:294	PNL–8120
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	19:436	PNL–8620
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	19:961	PNL–8809-Vol.2
	19:1038	PNL-SA–20214
	19:1131	PNL–7732
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	19:1956	PNL–8812
	19:1957	PNL–8820
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	19:2870	PNL–8924
	19:2871	PNL-SA–21755
	19:308	PNL–8908
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	19:737	NUREG/CR–6043-Vol.1
	19:793	NUREG/CR–4469-Vol.15
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications	
	19:2228	NUREG/CR–5631-Rev.1-Add.1
	Battelle Memorial Inst., Richland, WA (United States)	
	19:409	DOE/EA–0785
	Hanford Atomic Products Operation, Richland, WA (United States)	
	19:213	HW–48325
	19:219	HW–79645
	19:265	HW–43561-RD
	USAEC Hanford Operations Office, Richland, WA (United States)	
	19:765	HAN–27115
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Safety and Analysis	
	19:794	NUREG/CR–5829
AC06-87RL10930	**Westinghouse Hanford Co., Richland, WA (United States)**	
	19:223	WHC-SA–1821
	19:230	WHC-SA–2021
	19:231	WHC-SA–2087
	19:345	WHC-EP–0182-63
	19:346	WHC-EP–0393-Rev.3-Pt.1
	19:347	WHC-EP–0393-Rev.3-Pt.2
	19:348	WHC-EP–0643-Rev.1
	19:349	WHC-MR–0433
	19:350	WHC-SA–1799
	19:351	WHC-SA–1811
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	19:353	WHC-SA–1935
	19:354	WHC-SA–1975
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	19:360	WHC-SA–2108
	19:361	WHC-SD-EN-TI–195
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	19:363	WHC-SD-W026-TRP–006
	19:388	WHC-SA–1792
	19:389	WHC-SD-EN-SD–001
	19:452	WHC-EP–0619-Vol.3
	19:453	WHC-EP–0684
	19:454	WHC-EP–0688
	19:455	WHC-MR–0270
	19:456	WHC-SA–1997
	19:457	WHC-SA–2018
	19:458	WHC-SA–2056
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	19:463	WHC-SD-EN-AP–140
	19:464	WHC-SD-EN-TI–181
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	19:845	WHC-EP–0682
	19:846	WHC-SA–1797-Rev.1
	19:1402	WHC-MR–0425
	19:1403	WHC-SA–1714
	19:1816	WHC-SD-EN-RPT–005

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	19:1890	WHC-SA–1939
	19:1983	DOE/RL–93-19
	19:2087	WHC-EP–0679
	19:2088	WHC-SA–1941
	19:2089	WHC-SA–2064
	19:2091	WHC-SD-EN-AP–147
	19:2092	WHC-SD-EN-TI–164
	19:2278	WHC-SA–1764
	19:256	DOE/RL–93-44
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	19:2090	WHC-SD-EN-AP–145
	19:2093	WHC-SD-EN-TI–198
	United Nuclear Industries, Inc., Richland, WA (United States)	
	19:773	UNI–138
	USDOE Richland Operations Office, WA (United States)	
	19:1982	DOE/RL–92-29
	USDOE Richland Field Office, WA (United States)	
	19:421	DOE/RL–91-45-Rev.2
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	19:22	EGG–2712
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	19:734	EGG-MS–10781
	19:850	EGG-PIR–10633(2Q-93)
	19:1600	EGG-M–93041
	19:1984	EGG–2678(92)
	19:1985	EGG-EEL–10752
	19:1986	EGG-ERD–10453
	19:1987	EGG-WTD–10660
	19:2240	EGG-WM–10661
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	19:1860	JAB–10733-2
AC09-76SR00001	**Dow Chemical Co., Golden, CO (United States). Rocky Flats Div.**	
	19:1438	CONF-740807–1
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States)	
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	19:190	SR/H–630
	19:191	SR/H–631
	19:222	SR/H–655
	19:1048	SR/H–659
	19:1050	SR/H–661
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Lab.	
	19:752	DP–403
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant	
	19:229	SR/H–649
	19:337	SR/H–644
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States)	
	19:338	SR/H–645
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept.	
	19:205	SR/H–654
	19:1043	SR/H–652
	19:1044	SR/H–653
	19:1046	SR/H–657
	19:1049	SR/H–660
	19:1395	SR/H–650
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept.	
	19:185	SR/H–625
	19:186	SR/H–626
	19:187	SR/H–627
	19:188	SR/H–628
	19:192	SR/H–632
	19:193	SR/H–633
	19:194	SR/H–634
	19:195	SR/H–635
	19:196	SR/H–638
	19:197	SR/H–639
	19:198	SR/H–640
	19:199	SR/H–641
	19:200	SR/H–642
	19:201	SR/H–646
	19:202	SR/H–647
	19:203	SR/H–648
	19:228	SR/H–622
	19:335	SR/H–623
	19:336	SR/H–637
	19:447	SR/H–624
	19:1047	SR/H–658
	General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation	
	19:1045	SR/H–656
	Hanford Engineer Works, Richland, WA (United States)	
	19:204	SR/H–651
AC09-89SR18035	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Lab.**	
	19:752	DP–403
	Westinghouse Savannah River Co., Aiken, SC (United States)	
	19:370	WSRC-MS–92-491
	19:371	WSRC-MS–93-284
	19:372	WSRC-MS–93-442
	19:373	WSRC-MS–93-444
	19:374	WSRC-MS–93-475
	19:375	WSRC-MS–93-555
	19:376	WSRC-RP–93-542
	19:377	WSRC-TR–92-554-Rev.1
	19:379	WSRC-TR–93-0111-Rev.1
	19:469	WSRC-MS–93-224
	19:470	WSRC-MS–93-454
	19:471	WSRC-MS–93-481
	19:472	WSRC-RP–92-824-Rev.1
	19:742	WSRC–MS-93-479
	19:806	WSRC-MS–93-469
	19:807	WSRC-TR–92-100-10
	19:1067	WSRC-MS–93-010
	19:1226	WSRC-RP–91-865

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	19:1257	WSRC-MS–93-169
	19:1371	WSRC-TR–91-106
	19:1404	WSRC-MS–93-286
	19:1405	WSRC-MS–93-441
	19:1406	WSRC-TR–93-365
	19:1832	WSRC-TR–91-435
	19:2094	WSRC-MS–93-039
	19:2095	WSRC-MS–93-158
	19:2096	WSRC-MS–93-390
	19:2097	WSRC-MS–93-511
	19:2098	WSRC-MS–93-513
	19:2099	WSRC-TR–93-391
	19:2249	WSRC-MS–92-235
	19:2327	WSRC-TR–93-430
	19:378	WSRC-TR–93-093
	19:762	DOE/SR/18035–T1-Exec.Summ.
	19:763	DOE/SR/18035–T1-Vol.3
AC11-89PN38014	**Bettis Atomic Power Lab., West Mifflin, PA (United States)**	
	19:1065	WAPD-T–2991
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Bettis Atomic Power Div.	
	19:1224	WAPD-T–2941
	Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab.	
	19:2529	WAPD-T–2954
AC11-93PN38195	**Bettis Atomic Power Lab., West Mifflin, PA (United States)**	
	19:660	WAPD-T–2942
	19:661	WAPD-T–2943
	19:710	WAPD-T–2958
	19:711	WAPD-T–2967
	19:741	WAPD-T–2931
	19:1429	WAPD-T–2984
	19:2086	WAPD-RC/E(EE)–2838
	19:2528	WAPD-T–2953
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Bettis Atomic Power Div.	
	19:1224	WAPD-T–2941
	Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab.	
	19:1066	WAPD-T–3004
	19:2529	WAPD-T–2954
AC12-76SN00052	**Knolls Atomic Power Lab., Schenectady, NY (United States)**	
	19:1016	KAPL–4759
	19:1017	KAPL–4760
AC21-86MC21023	**Foster Wheeler Development Corp., Livingston, NJ (United States)**	
	19:646	DOE/MC/21023–93/C0210
	Westinghouse Electric Corp., Orlando, FL (United States)	
	19:647	DOE/MC/21023–93/C0211
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center	
	19:662	DOE/MC/21023–93/C0212
AC21-86MC23166	**Caterpillar, Inc., San Diego, CA (United States). Solar Turbines**	
	19:648	DOE/MC/23166–3414
AC21-87MC23170	**General Electric Environmental Services, Inc., Lebanon, PA (United States)**	
	19:649	DOE/MC/23170–93/C0228
AC21-87MC24257	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center**	
	19:663	DOE/MC/24257–93/C0216
AC21-88MC25003	**General Electric Co., Schenectady, NY (United States). Corporate Research and Development Dept.**	
	19:10	DOE/MC/25003–93/C0218
AC21-88MC25034	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center**	
	19:664	DOE/MC/25034–93/C0231
AC21-89MC25177	**Gilbert/Commonwealth, Inc., Reading, PA (United States)**	
	19:53	DOE/MC/25177–93/C0226
	19:650	DOE/MC/25177–3307
AC21-89MC26040	**Energy Research Corp., Danbury, CT (United States)**	
	19:1159	DOE/MC/26040–93/C0220
AC21-89MC26288	**Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)**	
	19:651	DOE/MC/26288–93/C0223
AC21-89MC26366	**Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering**	
	19:1160	DOE/MC/26366–3456
AC21-89MC26367	**Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)**	
	19:12	DOE/MC/26367–3461
	19:13	DOE/MC/26367–3463
AC21-89MC26372	**Worcester Polytechnic Inst., MA (United States)**	
	19:14	DOE/MC/26372–93/C0202
AC21-90MC26365	**California Inst. of Tech., Pasadena, CA (United States)**	
	19:515	DOE/MC/26365–3423
AC21-90MC27224	**Research Triangle Inst., Research Triangle Park, NC (United States)**	
	19:1118	DOE/MC/27224–93/C0199
AC21-90MC27394	**M-C Power Corp., Burr Ridge, IL (United States)**	
	19:882	DOE/MC/27394–94/C0263
AC21-90MC27423	**Combustion Power Co., Inc., Menlo Park, CA (United States)**	
	19:667	DOE/MC/27423–93/C0215
AC21-91MC27233	**Kellogg (M.W.) Co., Houston, TX (United States)**	
	19:15	DOE/MC/27233–93/C0209
AC21-91MC28087	**Stanford Univ., CA (United States). Dept. of Geophysics**	
	19:99	DOE/MC/28087–3464
AC21-92MC28016	**North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center**	
	19:1905	DOE/MC/28016–93/C0222
AC21-92MC29220	**Argonne National Lab., IL (United States)**	
	19:1161	DOE/MC/29220–93/C0221
AC21-92MC29245	**Allied-Signal, Inc., Des Plaines, IL (United States)**	
	19:1162	DOE/MC/29245–93/C0205
AC21-92MC29246	**Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering**	
	19:17	DOE/MC/29246–93/C0219
	19:18	DOE/MC/29246–3460
AC22-87PC79672	**TRW, Inc., Redondo Beach, CA (United States). Applied Technology Div.**	
	19:875	DOE/PC/79672–T7
AC22-88PC88818	**Hydrocarbon Research, Inc., Princeton, NJ (United States)**	
	19:21	DOE/PC/88818–T2
AC22-89BC14474	**Michigan Univ., Ann Arbor, MI (United States)**	
	19:72	DOE/BC/14474–15

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AC22-91PC90046	Union Carbide Chemicals and Plastics Co., Inc., South Charleston, WV (United States). South Charleston Technical Center	
	19:546	DOE/PC/90046–T1
AC22-92BC14831	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering	
	19:73	DOE/BC/14831–4
AC22-92BC14886	Surtek, Inc., Golden, CO (United States)	
	19:74	DOE/BC/14886–3
AC22-92PC92106	Surface/Interface, Inc., Mountain View, CA (United States)	
	19:1250	DOE/PC/92106–T3
AC34-90DP62349	EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
	19:311	RFP–4767
	19:312	RFP–4779
	19:1039	RFP–4627
	19:1959	RFP–4783
AC34-90RF62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	19:387	RFP–4746
	19:2116	RFP–4738
	19:438	RFP–4726
	EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
	19:439	RFP–4775
	19:842	RFP–4787
	19:1387	RFP–4727
	19:1958	RFP–4763
AC35-89ER40486	Superconducting Super Collider Lab., Dallas, TX (United States)	
	19:1487	SSCL-Preprint–470
	19:1488	SSCL-Preprint–505
	19:1505	SSCL–647
	19:1506	SSCL-Preprint–511
	19:1574	SSCL–644
	19:1575	SSCL–646
	19:1576	SSCL-Preprint–486
	19:1577	SSCL-Preprint–499
AC79-92BP21985	USDOE Bonneville Power Administration, Portland, OR (United States)	
	19:547	DOE/BP/21985–4
	19:548	DOE/BP/21985–7
AC79-92BP25174	USDOE Bonneville Power Administration, Portland, OR (United States). Office of Energy Resources	
	19:892	DOE/BP/25174–2
	19:893	DOE/BP/25174–3
	19:894	DOE/BP/25174–4
	19:895	DOE/BP/25174–5
	19:896	DOE/BP/25174–6
	19:897	DOE/BP/25174–7
	19:898	DOE/BP/25174–8
	19:899	DOE/BP/25174–9
	19:900	DOE/BP/25174–10
	19:901	DOE/BP/25174–11
	19:902	DOE/BP/25174–12
AI01-85CE50111	National Aeronautics and Space Administration, Cleveland, OH (United States). Lewis Research Center	
	19:965	DOE/NASA/0335–5
AI01-91CE50306	Wisconsin Univ., Madison, WI (United States). Dept. of Mechanical Engineering	
	19:966	DOE/NASA–1087-2
AI05-84OR21411	Army Materials Research Agency, Watertown, MA (United States). Materials Technology Lab.	
	19:1084	DOE/OR/21411–T2
AI05-88ER13823	National Inst. of Standards and Technology, Boulder, CO (United States). Thermophysics Div.	
	19:1811	CONF-9305134–3-App.A
AI05-91OR21971	Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). Geotechnical Lab.	
	19:419	DOE/OR/21971–T2
AI05-93OR22089	Geological Survey, Menlo Park, CA (United States)	
	19:2255	DOE/OR/22089–2
AI06-91RL12089	National Oceanic and Atmospheric Administration, Boulder, CO (United States). Wave Propagation Lab.	
	19:1815	DOE/RL/12089–T2
AI06-91RL12090	National Oceanic and Atmospheric Administration, Boulder, CO (United States). Wave Propagation Lab.	
	19:1815	DOE/RL/12089–T2
AI06-91RL12092	National Oceanic and Atmospheric Administration, Boulder, CO (United States). Wave Propagation Lab.	
	19:1815	DOE/RL/12089–T2
AI08-86NV10522	Environmental Protection Agency, Las Vegas, NV (United States). Environmental Monitoring Systems Lab.	
	19:1907	EPA–600/R-93/141
AI21-89MC26018	National Inst. for Occupational Safety and Health, Morgantown, WV (United States)	
	19:67	DOE/MC/26018–3439
	19:2239	DOE/MC/26018–3438
AS03-76ER70285	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:1596	SLAC-PUB–6197
AT79-91BP15474	O'Neill and Co., Seattle, WA (United States)	
	19:821	DOE/BP/15474–T1
BI79-91BP60629	USDOE Bonneville Power Administration, Portland, OR (United States). Div. of Fish and Wildlife	
	19:551	DOE/BP/60629–6
FC02-86CH10311	Sandia National Labs., Albuquerque, NM (United States)	
	19:645	SAND–93-1375C
FC03-90ER61010	California Univ., Davis, CA (United States)	
	19:98	DOE/ER/61010–T11
FC05-89CE90052	Georgia Inst. of Tech., Atlanta, GA (United States). School of Material Engineering	
	19:1082	DOE/CE/90052–T1
FC08-90NV10872	Nevada Univ., Las Vegas, NV (United States)	
	19:242	CONF-9304190–1
	19:254	DOE/NV/10872–T84
	19:1423	DOE/NV/10872–T59
FC21-86MC10637	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	19:32	DOE/MC/10637–93/C0204
FC21-86MC11076	Utah Univ., Salt Lake City, UT (United States). Dept. of Fuels Engineering	
	19:162	DOE/MC/11076–3380
	University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst.	
	19:90	DOE/MC/11076–3425
	Western Research Inst., Laramie, WY (United States)	
	19:76	DOE/MC/11076–3424
	19:164	DOE/MC/11076–3410
	19:1822	DOE/MC/11076–3411

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FC21-87MC24132	American Electric Power Service Corp., Columbus, OH (United States)	
	19:50	DOE/MC/24132–93/C0234
FC21-87MC24207	West Virginia Univ., Morgantown, WV (United States)	
	19:1422	DOE/MC/24207–3325
	West Virginia Univ., Morgantown, WV (United States). Dept. of Chemical Engineering	
	19:51	DOE/MC/24207–3323
	19:1001	DOE/MC/24207–3326
	West Virginia Univ., Morgantown, WV (United States). Dept. of Mechanical and Aerospace Engineering	
	19:52	DOE/MC/24207–3324
FC21-89MC26042	American Electric Power Service Corp., Columbus, OH (United States)	
	19:666	DOE/MC/26042–93/C0213
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center	
	19:662	DOE/MC/21023–93/C0212
FC21-90MC25140	Southern Co. Services, Inc., Birmingham, AL (United States)	
	19:11	DOE/MC/25140–93/C0225
	19:665	DOE/MC/25140–93/C0224
FC21-91MC26308	ABB/Combustion Engineering, Inc., Windsor, CT (United States)	
	19:652	DOE/MC/26308–3466
FC21-91MC27364	Pyropower Corp., San Diego, CA (United States)	
	19:55	DOE/MC/27364–93/C0229
	Ahlstrom Pyropower, Inc., San Diego, CA (United States)	
	19:54	DOE/MC/27364–93/C0227
FC21-91MC28060	Dravo Lime Co., Pittsburgh, PA (United States)	
	19:926	DOE/MC/28060–93/C0232
FC21-91MC28176	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	19:101	DOE/MC/28176–3455
FC21-92MC27391	Kerr-McGee Coal Corp., Oklahoma City, OK (United States)	
	19:16	DOE/MC/27391–3479
FC21-92MC28065	M-C Power Corp., Burr Ridge, IL (United States)	
	19:883	DOE/MC/28065–94/C0249
FC21-93MC30126	Western Research Inst., Laramie, WY (United States)	
	19:1163	DOE/MC/30126–93/C0200
FC22-83FE60149	National Inst. for Petroleum and Energy Research, Bartlesville, OK (United States)	
	19:80	NIPER–717
FC22-93BC14954	Research and Engineering Consultants, Inc., New Raymer, CO (United States)	
	19:75	DOE/BC/14954–2
FC22-93BC14956	Oklahoma Univ., Norman, OK (United States)	
	19:68	DOE/BC/14956–2
FG02-84ER45076	Wisconsin Univ., Milwaukee, WI (United States)	
	19:1157	DOE/ER/45076–3
	19:1158	DOE/ER/45076–T2
FG02-84ER45127	Polytechnic Univ., Brooklyn, NY (United States)	
	19:2562	DOE/ER/45127–9
FG02-85ER13406	Wisconsin Univ., Madison, WI (United States)	
	19:1244	DOE/ER/13406–8
FG02-85ER53198	Wisconsin Univ., Madison, WI (United States). Dept. of Physics	
	19:2632	DOE/ER/53198–226
	Wisconsin Univ., Madison, WI (United States). Plasma Physics Research	
	19:2630	DOE/ER/53198–223
	19:2631	DOE/ER/53198–224
FG02-86ER13519	Cornell Univ., Ithaca, NY (United States). Ward Lab.	
	19:2550	CONF-920948–21
FG02-86ER13537	Pennsylvania State Univ., University Park, PA (United States)	
	19:30	DOE/ER/13537–2
	19:31	DOE/ER/13537–T6
FG02-86ER13554	Brookhaven National Lab., Upton, NY (United States)	
	19:1321	BNL–48923
FG02-86ER13582	Colorado State Univ., Fort Collins, CO (United States)	
	19:1245	DOE/ER/13582–T3
FG02-86ER53218	Wisconsin Univ., Madison, WI (United States). Dept. of Nuclear Engineering and Engineering Physics	
	19:2633	DOE/ER/53218–22
	Wisconsin Univ., Madison, WI (United States). Center for Plasma Theory and Computation	
	19:2727	UW-CPTC–93-5
FG02-86ER60408	Chicago Univ., IL (United States)	
	19:2162	DOE/ER/60408–5
FG02-86NE37969	Oak Ridge Inst. for Science and Education, TN (United States)	
	19:1119	DOE/OR/00033–T553
FG02-87ER13671	Brookhaven National Lab., Upton, NY (United States)	
	19:1263	BNL–48923
FG02-87ER13695	Brookhaven National Lab., Upton, NY (United States)	
	19:1262	BNL–48923
FG02-87ER13777	Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Chemical Engineering	
	19:1246	DOE/ER/13777–T2
FG02-87ER13790	Delaware Univ., Newark, DE (United States). Center for Catalytic Science and Technology	
	19:1247	DOE/ER/13790–5
FG02-88ER13914	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	19:1276	DOE/ER/13914–16
FG02-88ER40412	Purdue Research Foundation, Lafayette, IN (United States)	
	19:2357	DOE/ER/40412–1
FG02-88ER40413	Brookhaven National Lab., Upton, NY (United States)	
	19:2460	BNL–49548
FG02-88ER45337	Minnesota Univ., Minneapolis, MN (United States). Corrosion Research Center	
	19:1000	DOE/ER/45337–T5
FG02-88ER53264	Wisconsin Univ., Madison, WI (United States)	
	19:2738	DOE/ER/53264–4
FG02-89ER12891	Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering	
	19:176	DOE/ER/12891–4
FG02-89ER13988	Princeton Univ., NJ (United States). Dept. of Mechanical and Aerospace Engineering	
	19:1368	DOE/ER/13988–T2

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FG02-89ER14052	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	19:2735	CONF-930511–493
	19:2737	DOE/ER/14052–3
FG02-89ER14079	Colorado School of Mines, Golden, CO (United States). Center for Wave Phenomena	
	19:2254	DOE/ER/14079–27
FG02-89ER60898	Illinois Univ., Chicago, IL (United States). Dept. of Physics	
	19:2519	CONF-911296–11-App.4
FG02-90CE27504	Public Technology, Inc., Washington, DC (United States)	
	19:954	DOE/CE/27504–T3
FG02-90ER14121	Purdue Univ., Lafayette, IN (United States). Dept. of Chemistry	
	19:1248	DOE/ER/14121–2
FG02-90ER14132	Brookhaven National Lab., Upton, NY (United States)	
	19:1233	BNL–48923
FG02-90ER40553	Mount Holyoke Coll., South Hadley, MA (United States)	
	19:2440	CONF-930761–1
FG02-90ER45427	Iowa State Univ. of Science and Technology, Ames, IA (United States)	
	19:1089	IS-M–766
FG02-90ER45428	Pennsylvania State Univ., University Park, PA (United States)	
	19:1083	DOE/ER/45428–T1
FG02-90ER45429	Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Nuclear Engineering	
	19:1615	DOE/ER/45429–2
FG02-90ER61029	Clarkson Univ., Potsdam, NY (United States). Dept. of Chemistry	
	19:1904	DOE/ER/61029–15
FG02-91ER40645	Brookhaven National Lab., Upton, NY (United States)	
	19:2460	BNL–49548
FG02-91ER40661	Indiana Univ., Bloomington, IN (United States). Dept. of Physics	
	19:1614	DOE/ER/40661–6
FG02-91ER40672	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:2401	SLAC-PUB–6285
FG02-91ER40677	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:2401	SLAC-PUB–6285
FG02-91ER45460	Northwestern Univ., Evanston, IL (United States)	
	19:1115	CONF-9211267–1
	19:1117	CONF-9309242–1
FG02-91ER54109	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	19:2739	DOE/ET/53088–626
FG02-91ER61200	Oak Ridge Associated Universities, Inc., TN (United States)	
	19:1980	DOE/OR/00033–T567
FG02-91ER75660	University of Southern Mississippi, Hattiesburg, MS (United States)	
	19:2804	DOE/ER/75660–2
FG02-91ER81186	ICET, Inc., Norwood, MA (United States)	
	19:881	DOE/ER/81186–94/C0265
FG02-91ER81190	Lawrence Livermore National Lab., CA (United States)	
	19:2585	UCRL-JC–114285
FG02-92ER14244	Chicago Univ., IL (United States)	
	19:1820	DOE/ER/14244–1
FG02-92ER40715	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:2401	SLAC-PUB–6285
FG02-92ER61420	Cold Spring Harbor Lab., NY (United States)	
	19:2133	DOE/ER/61420–1
FG02-92ER61442	Cold Spring Harbor Lab., NY (United States)	
	19:2163	DOE/ER/61442–1
FG02-93ER12130	Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering	
	19:999	DOE/ER/12130–1
FG02-93ER40768	Brookhaven National Lab., Upton, NY (United States)	
	19:2459	BNL–49499
FG03-86ER45230	Los Alamos National Lab., NM (United States)	
	19:1022	LA-UR–93-3143
FG03-86ER45264	Oak Ridge National Lab., TN (United States)	
	19:997	CONF-930997–5
FG03-87ER13812	Brookhaven National Lab., Upton, NY (United States)	
	19:1312	BNL–48923
FG03-87ER25043	University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering	
	19:2833	CONF-900874–5
	19:2834	CONF-900992–3
	19:2836	CONF-9104425–1
	19:2837	CONF-9106442–1
	University of Southern California, Los Angeles, CA (United States). Computer Research Inst.	
	19:2830	CONF-8804338–1
	19:2831	CONF-880540–4
	University of Southern California, Los Angeles, CA (United States). Dept. of Electrical Engineering Systems	
	19:2832	CONF-8912178–1
	19:2835	CONF-901221–2
FG03-88ER53275	California Univ., Berkeley, CA (United States). Electronics Research Lab.	
	19:2721	UCB/ERL-M–92/145
FG03-90ER54079	California Univ., Berkeley, CA (United States). Electronics Research Lab.	
	19:1396	UCB/ERL-M–92/146
	19:2721	UCB/ERL-M–92/145
	19:2722	UCB/ERL-M–92/147
	19:2723	UCB/ERL-M–92/148
FG03-90ER80998	TDA Research, Inc., Wheat Ridge, CO (United States)	
	19:9	DOE/ER/80998–93/C0217
FG03-91ER40618	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:2401	SLAC-PUB–6285
FG03-92ER25116	Stanford Univ., CA (United States). Systems Optimization Lab.	
	19:2877	SOL–93-6
FG03-92ER40689	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:1551	SLAC–419
FG03-92ER40695	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:1554	SLAC-PUB–6145
FG03-92ER40701	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
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FG03-92ER40718	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
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FG03-93ER40759	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:1554	SLAC-PUB–6145

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FG04-87ER13746	Los Alamos National Lab., NM (United States)	
	19:2540	LA-SUB–93-275
FG05-80ET53088	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	19:2634	DOE/ET/53088–602
	19:2635	DOE/ET/53088–614
	19:2636	DOE/ET/53088–621
	19:2637	DOE/ET/53088–623
	19:2739	DOE/ET/53088–626
FG05-85ER13373	Catholic Univ. of America, Washington, DC (United States). Dept. of Chemistry	
	19:1243	DOE/ER/13373–T3
FG05-86ER13613	Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry	
	19:1155	DOE/ER/13613–45
FG05-87ER13795	Texas Univ., Arlington, TX (United States). Dept. of Geology	
	19:2252	DOE/ER/13795–T1
FG05-87ER40309	Brookhaven National Lab., Upton, NY (United States)	
	19:2460	BNL–49548
FG05-87ER40319	Brookhaven National Lab., Upton, NY (United States)	
	19:2375	BNL–49462
FG05-88ER13951	Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Dept. of Geological Sciences	
	19:247	DOE/ER/13951–5
FG05-88ER13958	Toledo Univ., OH (United States). Dept. of Physics and Astronomy	
	19:2530	DOE/ER/13958–43
FG05-88ER25068	Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States)	
	19:2842	DOE/ER/25068–2
FG05-88ER53267	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	19:2739	DOE/ET/53088–626
FG05-89ER14061	National Academy of Sciences, Washington, DC (United States)	
	19:2253	DOE/ER/14061–2
FG05-92ER79119	Stanford Univ., CA (United States). High Temperature Gasdynamics Lab.	
	19:1821	DOE/ER/79119–1
FG05-93ER40770	Oak Ridge National Lab., TN (United States)	
	19:2304	CONF-9209239–8
FG06-85E	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	19:2401	SLAC-PUB–6285
FG06-86ER13567	Washington State Univ., Pullman, WA (United States)	
	19:1420	DOE/ER/13567–2
	19:1421	DOE/ER/13567–4
FG06-87ER13664	Oregon Graduate Center, Beaverton, OR (United States)	
	19:1275	DOE/ER/13664–4
FG06-91ER14172	Westinghouse Hanford Co., Richland, WA (United States)	
	19:2278	WHC-SA–1764
FG06-91ER14224	Washington Univ., Seattle, WA (United States). Dept. of Chemistry	
	19:1156	DOE/ER/14224–T1
FG06-91ER20054	Oregon Univ., Eugene, OR (United States). Inst. of Molecular Biology	
	19:2130	DOE/ER/20054–2
FG08-85NV10461	Nevada Nuclear Waste Project Office, Carson City, NV (United States)	
	19:288	NWPO-TR–015-90
	19:289	NWPO-TR–020-93
FG21-89MC26031	New Mexico Inst. of Mining and Technology, Socorro, NM (United States). New Mexico Petroleum Recovery Research Center	
	19:77	DOE/MC/26031–12
FG22-89PC89785	Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry	
	19:33	DOE/PC/89785–15
	19:1249	DOE/PC/89785–13
FG22-90PC90310	Texas A and M Univ., College Station, TX (United States). Dept. of Mechanical Engineering	
	19:58	DOE/PC/90310–T12
FG22-91PC91283	Tuskegee Univ., AL (United States). Dept. of Chemical Engineering	
	19:34	DOE/PC/91283–T8
	19:35	DOE/PC/91283–T9
FG22-91PC91309	Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Center for Advanced Ceramic Materials	
	19:1085	DOE/PC/91309–T9
FG49-92CE15500	Clauser (John F.), Walnut Creek, CA (United States)	
	19:1810	DOE/CE/15500–T3
W-31109-ENG-38	Argonne National Lab., Idaho Falls, ID (United States)	
	19:225	ANL/FC/CP–78840
	19:395	ANL/FE/CP–79340
	19:715	ANL/FC/CP–80288
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	19:1415	ANL/FC/CP–76325
	Argonne National Lab., IL (United States)	
	19:6	ANL/CHM/CP–79226
	19:89	ANL/ESD/TM–52
	19:156	ANL/ES/CP–79268
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	19:208	ANL/CMT/PP–75527
	19:233	ANL/CMT/CP–78043
	19:234	ANL/CMT/CP–78477
	19:235	ANL/CMT/CP–79275
	19:236	ANL/CMT/CP–79779
	19:237	ANL/CMT/CP–80775
	19:238	ANL/DIS/CP–80955
	19:240	ANL/EAIS/CP–80858
	19:241	ANL/RE/CP–80533
	19:390	ANL/CMT/CP–80310
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	19:392	ANL/EA/CP–79850
	19:393	ANL/EA/CP–79944
	19:394	ANL/EAIS/CP–79748
	19:490	ANL/MSD/CP–78737
	19:672	ANL/EAIS/PP–74946
	19:690	ANL/ET/CP–79638
	19:691	ANL/MCT/CP–78784
	19:748	ANL/RA/CP–79576
	19:759	ANL/NPR–93/002
	19:774	ANL/ET/CP–81036
	19:775	ANL/RE/CP–78893
	19:848	ANL/DIS/RP–80855
	19:868	ANL/DIS/CP–81110
	19:877	ANL/CMT/CP–79617
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	19:924	ANL/ES/CP–78708
	19:925	ANL/ES/CP–80360

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	19:980	ANL/OTD-ER/CP–79937		19:1895	ANL/ER/CP–79760
	19:985	ANL/MSD/CP–80905		19:1896	ANL/ER/CP–79787
	19:987	ANL/EP/CP–79739		19:1897	ANL/ER/CP–80454
	19:988	ANL/ET/CP–79400		19:1898	ANL/ER/CP–80457
	19:989	ANL/ET/CP–80756		19:1972	ANL/CMT/CP–79321
	19:990	ANL/ET/CP–80862		19:1973	ANL/EA/CP–79679
	19:991	ANL/MCT/CP–77517		19:1974	ANL/EAIS/CP–80710
	19:992	ANL/MSD/CP–79360		19:2058	IR-CR–93075
	19:993	ANL/MSD/CP–79906		19:2059	IR-CR–93076
	19:994	ANL/MSD/CP–79942		19:2060	IR-CR–93077
	19:995	ANL/MSD/CP–80646		19:2061	IR-CR–93078
	19:1068	ANL/CHM/CP–79242		19:2062	IR-CR–93079
	19:1070	ANL/ET/CP–79613		19:2063	IR-CR–93080
	19:1071	ANL/IPNS/CP–79265		19:2064	IR-CR–93081
	19:1072	ANL/MCT/CP–79124		19:2065	IR-CR–93082
	19:1073	ANL/MSD/CP–80634		19:2066	IR-CR–93086
	19:1074	ANL/MSD/CP–80635		19:2067	IR-CR–93087
	19:1075	ANL/MSD/CP–80681		19:2068	IR-CR–93088
	19:1076	ANL/MSD/CP–80860		19:2127	ANL/BIM/PP–72224
	19:1077	ANL/MSD/CP–80962		19:2128	ANL/CMB/PP–80296
	19:1078	ANL/MSD/PP–75442		19:2135	ANL/CMB/PP–80478
	19:1108	ANL/CHM/CP–80106		19:2136	ANL/MCS/CP–80305
	19:1109	ANL/ET/CP–78614		19:2161	ANL/CMB/PP–73969
	19:1110	ANL/IPNS/CP–79847		19:2177	ANL/BIM/PP–77489
	19:1111	ANL/MSD/CP–78506		19:2178	ANL/BIM/PP–78894
	19:1112	ANL/MSD/CP–79238		19:2179	ANL/CMB/PP–80219
	19:1113	ANL/MSD/CP–79440		19:2180	ANL/CMB/PP–80243
	19:1114	ANL/RE/CP–80143		19:2181	ANL/CMB/PP–80927
	19:1147	ANL/CHM/CP–79025		19:2182	ANL/CMT/CP–80616
	19:1148	ANL/CMT/CP–79185		19:2183	ANL/CMT/CP–80617
	19:1161	DOE/MC/29220–93/C0221		19:2184	ANL/EA/CP–79756
	19:1280	ANL/CHM/CP–79022		19:2186	ANL/EAIS/TM–103
	19:1372	ANL/RE/CP–80234		19:2238	ANL/BIM/PP–75359
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	19:1416	ANL/MCT/CP–79317		19:2303	ANL/ET/CP–79670
	19:1464	ANL/PHY/CP–80830		19:2331	ANL-HEP-CP–93-70
	19:1469	ANL/ASD/CP–79458		19:2332	ANL-HEP-CP–93-77
	19:1470	ANL/ASD/CP–80266		19:2354	ANL-HEP-CP–93-67
	19:1507	ANL/ASD/CP–79651		19:2369	ANL-HEP-CP–93-51
	19:1508	ANL/ASD/CP–80971		19:2370	ANL-HEP-CP–93-63
	19:1509	ANL/ECT/CP–80138		19:2371	ANL-HEP-CP–93-68
	19:1511	ANL/PHY/CP–80460		19:2372	ANL-HEP–TR-91-13
	19:1512	ANL/PHY/CP–80620		19:2373	ANL/PHY/CP–80703
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	19:1514	ANL/XFD/CP–78645		19:2455	ANL/PHY/CP–80692
	19:1515	ANL/XFD/CP–79799		19:2456	ANL/PHY/CP–80848
	19:1516	ANL/XFD/CP–80250		19:2457	ANL/PHY/CP–81005
	19:1517	ANL/XFD/CP–80251		19:2531	ANL/CHM/CP–80473
	19:1518	ANL/XFD/CP–80254		19:2536	ANL/CHM/PP–79176
	19:1519	ANL/XFD/CP–80255		19:2557	ANL-HEP-CP–93-76
	19:1520	ANL/XFD/CP–80408		19:2571	ANL/APS/CP–5
	19:1578	ANL/APS/IN/VIB–93/6		19:2572	ANL/XFD/CP–79184
	19:1579	ANL/APS/IN/VIB–93/8		19:2589	ANL/CHM/CP–80916
	19:1580	ANL/ASD/CP–78734		19:2597	ANL/CHM/PP–77001
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	19:1586	ANL/XFD/CP–80252		19:2730	ANL/EP/CP–79902
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	19:1601	ANL-HEP-CP–93-79		19:2732	ANL/EP/CP–80924
	19:1602	ANL-HEP-TR–90-89		19:2733	ANL/ET/CP–80889
	19:1603	ANL-HEP-TR–90-102		19:2823	ANL–93/26
	19:1604	ANL-HEP-TR–91-26		19:2824	ANL–93/28
	19:1605	ANL-HEP-TR–93-55		19:2826	ANL/MCS-TM–179
	19:1607	ANL/PHY/CP–80890		19:2827	ANL/MCS-TM–180
	19:1608	ANL/RE/CP–78949		19:2828	ANL/MCS-TM–181
	19:1609	ANL/XFD/CP–80859		19:1069	ANL/ET/CP–79207
	19:1817	ANL/FE/CP–80378		19:1230	ANL/CHM/CP–80906
	19:1893	ANL/EAIS/CP–78684		19:1510	ANL/EP/CP–80799
	19:1894	ANL/EAIS/CP–80792		19:1606	ANL-HEP-TR–93-73

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	19:2353	ANL-HEP-CP-93-60
	19:2454	ANL/PHY/CP-79186
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	Los Alamos National Lab., NM (United States)	
	19:1301	LA-UR-93-3464
	19:2514	LA-UR-93-3334
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	19:683	NUREG/CR-4667-Vol.16
	Argonne National Lab., Washington, DC (United States)	
	19:239	ANL/EA/CP-79596
	19:822	ANL/EAIS/CP-79749
	Argonne National Lab., IL (United States). Environmental Assessment and Information Sciences Div.	
	19:103	ANL/EAIS/TM-104
	19:2185	ANL/EAIS/RP-75543
	19:2825	ANL/EAIS-9
	Argonne National Lab., IL (United States). Energy Systems Div.	
	19:964	ANL/ESD/TM-53
	Argonne National Lab., IL (United States). Advanced Photon Source Accelerator Systems Div.	
	19:1468	ANL/APS/IN/VIB-93/1
	USDOE Oak Ridge Field Office, TN (United States)	
	19:412	DOE/EIS-0185F
	Electro-Petroleum, Inc., Wayne, PA (United States)	
	19:406	DOE/CH-9206
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	19:93	LA-SUB-93-274(10/91)
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	19:2584	UCRL-JC-113254
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79740	19:2728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040228	MF-423
79741	19:2729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001340	MF-423
79902	19:2730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002204	MF-423
79939	19:2731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019559	MF-420
80799	19:1510	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001342	
80924	19:2732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001426	MF-420; MF-426
ANL/ER/CP–					
79760	19:1895	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019526	MF-402
79787	19:1896	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018569	MF-402
80454	19:1897	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041164	MF-402
80457	19:1898	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041165	MF-402
ANL/ES/CP–					
78708	19:924	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040821	MF-321
78817	19:916	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019510	MF-335
79268	19:156	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001279	
80360	19:925	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018580	MF-312
80771	19:917	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001346	
ANL/ESD/TM–					
52	19:89	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000551	MF-310
53	19:964	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000907	MF-310
ANL/ET/CP–					
78614	19:1109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002347	MF-364; MF-404
78724	19:2598	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001326	MF-364
79207	19:1069	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000464	MF-700; MF-704
79400	19:988	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002376	MF-364
79613	19:1070	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040829	
79638	19:690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001352	
79670	19:2303	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040273	MF-900
80643	19:918	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001319	
80666	19:919	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041186	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
80756	19:989	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000466	
80862	19:990	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001431	MF-423
80889	19:2733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001466	MF-423
81036	19:774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002375	
ANL/FC/CP–					
76325	19:1415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041174	MF-533
78840	19:225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041183	MF-532
80288	19:715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041161	MF-524
ANL/FE/CP–					
78906	19:716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000465	MF-506
79340	19:395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001344	MF-506
80378	19:1817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001322	MF-520
ANL/IPNS/CP–					
79265	19:1071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040229	MF-401
79847	19:1110	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001320	MF-404
ANL/MCS-TM–					
179	19:2826	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001000	MF-405
180	19:2827	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000433	MF-405
181	19:2828	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002299	MF-405
ANL/MCS/CP–					
80305	19:2136	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041166	MF-405
ANL/MCT/CP–					
77517	19:991	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041178	MF-404
78784	19:691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001339	
78916	19:2599	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001324	MF-364
79124	19:1072	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041177	MF-332
79317	19:1416	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001325	MF-404
80158	19:2600	OSTI; NTIS; GPO Dep.	E 1.99:	DE93017416	MF-364
ANL/MSD/CP–					
78506	19:1111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001437	MF-404
78737	19:490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040281	MF-404
79238	19:1112	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040230	MF-404
79360	19:992	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001345	MF-404
79440	19:1113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040826	MF-404
79906	19:993	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001270	MF-404
79942	19:994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001333	MF-404
80634	19:1073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040277	MF-404
80635	19:1074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040278	MF-404
80646	19:995	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040822	MF-404
80681	19:1075	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041169	MF-404
80860	19:1076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001183	MF-404
80905	19:985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001289	MF-404
80962	19:1077	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001456	MF-404
ANL/MSD/PP–					
75442	19:1078	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040977	MF-404
ANL/NPR–					
93/002	19:759	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002408	MF-1030
ANL/OTD-APS/CP–					
80851	19:1584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002407	MF-411
ANL/OTD-ER/CP–					
79937	19:980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040237	MF-533
ANL/PHY/CP–					
78785	19:2298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041179	MF-411
79186	19:2454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000469	MF-411
80460	19:1511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040799	MF-413
80620	19:1512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040270	MF-411
80692	19:2455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041170	MF-413
80703	19:2373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041162	MF-411
80830	19:1464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001337	MF-413
80848	19:2456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001434	MF-414
80890	19:1607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001348	MF-411
80923	19:1513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001461	MF-413
81005	19:2457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002162	MF-413
ANL/RA/CP–					
79576	19:748	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002372	MF-506
ANL/RE/CP–					
78893	19:775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041175	
78949	19:1608	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001341	MF-900; MF-902
80143	19:1114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017450	MF-506

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80234	19:1372	OSTI; NTIS; GPO Dep.	E 1.99:	DE93017409	
80533	19:241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041188	MF-506
ANL/XFD/CP–					
78645	19:1514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019750	MF-411
79184	19:2572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001439	MF-411
79799	19:1515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040680	MF-411
80084	19:1585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001297	MF-404; MF-411
80250	19:1516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001291	MF-404; MF-411
80251	19:1517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001290	MF-404; MF-411
80252	19:1586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001288	MF-404; MF-411
80254	19:1518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001432	MF-411
80255	19:1519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001287	MF-404; MF-411
80408	19:1520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001275	MF-411
80843	19:1587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001332	MF-411
80859	19:1609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001294	MF-411
ASIPP–					
0033.	19:2617	*See* CNIC–00637			
0035.	19:2587	*See* CNIC–00653			
BARC–					
1992/E/045	19:1231	OSTI; NTIS (US Sales Only); INIS		DE94604121	
1993/E/009	19:2829	OSTI; NTIS (US Sales Only); INIS		DE94604652	
1993/E/010	19:1610	OSTI; NTIS (US Sales Only); INIS		DE94604640	
1993/E/014	19:1431	OSTI; NTIS (US Sales Only); INIS		DE94604564	
1993/P/003	19:1149	OSTI; NTIS (US Sales Only); INIS		DE94604074	
BFR-D–					
3-93	19:586	OSTI; NTIS		DE94709817	
5-93	19:889	OSTI; NTIS		DE94709816	
BFR-R–					
17-93	19:890	OSTI; NTIS		DE94709819	
18-93	19:891	OSTI; NTIS		DE94709818	
23-93	19:580	OSTI; NTIS		DE94709820	
3-93	19:587	OSTI; NTIS		DE94709813	
9-93	19:820	OSTI; NTIS		DE94709815	
BFR-T–					
4-93	19:1886	OSTI; NTIS		DE94709814	
BICM–					
0006.	19:1612	*See* CNIC–00644			
0007.	19:1285	*See* CNIC–00683			
BMI–					
2175	19:738	*See* NUREG/CR–6098			
BN-SA–					
3799-HEDR	19:2187	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018449	MF-505; MF-507
BNL–					
49344	19:1521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040178	MF-414
49347	19:1522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040166	MF-414
49390	19:7	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041151	MF-104
49412	19:2129	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041152	MF-408
49416	19:2403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040040	MF-414
49434	19:2165	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001489	MF-407
49445	19:2355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041120	MF-414
49448	19:2356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001381	MF-414
49453	19:2374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001380	MF-414
49462	19:2375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001386	MF-414
49463	19:717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001388	MF-400
49498	19:2458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001383	MF-414
49499	19:2459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001490	MF-413
49500	19:2376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001493	MF-413
49501	19:2377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001491	MF-413
49524	19:2140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002544	MF-408
49530	19:1899	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001897	MF-402
49534	19:1489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000732	MF-414
49537	19:880	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001492	MF-404
49548	19:2460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001900	MF-413
49551	19:1523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001894	MF-414
49602	19:70	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001770	MF-122

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52392	19:96	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001379	MF-350
BNL-NUREG–					
49116	19:776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019126	
51581-Vol.11	19:758	*See* NUREG/CR–2907-Vol.11			
52370	19:796	*See* NUREG/CR–6022			
BUP–					
1992-03	19:2800	OSTI; NTIS; INIS		DE94606281	
1992-17	19:2404	OSTI; NTIS; INIS		DE94606490	
CDNSWC/SSM–					
61-93/01	19:1035	*See* NUREG/CR–5981			
CEA-CONF–					
11371	19:172	OSTI; NTIS (US Sales Only); INIS		DE94604519	
11372	19:173	OSTI; NTIS (US Sales Only); INIS		DE94604682	
11373	19:174	OSTI; NTIS (US Sales Only); INIS		DE94604520	
11374	19:175	OSTI; NTIS (US Sales Only); INIS		DE94604521	
11378	19:2538	OSTI; NTIS (US Sales Only); INIS		DE94604966	
11380	19:2616	OSTI; NTIS (US Sales Only); INIS		DE94606812	
11417	19:209	OSTI; NTIS (US Sales Only); INIS		DE94604171	
11422	19:1281	OSTI; NTIS (US Sales Only); INIS		DE94604132	
11456	19:210	OSTI; NTIS (US Sales Only); INIS		DE94604172	
11464	19:692	OSTI; NTIS (US Sales Only); INIS		DE94604586	
11501	19:1900	OSTI; NTIS (US Sales Only); INIS		DE94604330	
11502	19:2188	OSTI; NTIS (US Sales Only); INIS		DE94604439	
11503	19:2104	OSTI; NTIS (US Sales Only); INIS		DE94604433	
11504	19:693	OSTI; NTIS (US Sales Only); INIS		DE94604587	
11505	19:1373	OSTI; NTIS (US Sales Only); INIS		DE94604539	
11512	19:1611	OSTI; NTIS (US Sales Only); INIS		DE94604653	
11514	19:1901	OSTI; NTIS (US Sales Only); INIS		DE94604331	
11518	19:1975	OSTI; NTIS (US Sales Only); INIS		DE94604283	
11519	19:1902	OSTI; NTIS (US Sales Only); INIS		DE94604332	
11522	19:755	OSTI; NTIS (US Sales Only); INIS		DE94604434	
CEA-R–					
5432	19:2243	OSTI; NTIS (US Sales Only)		DE94700002	
CEBAF-PR–					
93-010	19:1588	*See* DOE/ER/40150–229			
93-016	19:1490	*See* DOE/ER/40150–232			
93-019	19:1525	*See* DOE/ER/40150–213			
93-021	19:1526	*See* DOE/ER/40150–215			
93-026	19:1527	*See* DOE/ER/40150–234			
CEBAF-TH–					
93-05	19:2406	*See* DOE/ER/40150–240			
93-07	19:2405	*See* DOE/ER/40150–238			
93-09	19:2380	*See* DOE/ER/40150–236			
CERN-TH–					
6987/93	19:2370	*See* ANL-HEP-CP–93-63			
CIRP–					
0003.	19:2192	*See* CNIC–00669			
CNIC–					
00610	19:2189	OSTI; NTIS (US Sales Only); INIS		DE94604438	
00627	19:1282	OSTI; NTIS (US Sales Only); INIS		DE94604136	
00632	19:1242	OSTI; NTIS (US Sales Only); INIS		DE94604096	
00636	19:2166	OSTI; NTIS (US Sales Only); INIS		DE94604390	
00637	19:2617	OSTI; NTIS (US Sales Only); INIS		DE94604989	
00644	19:1612	OSTI; NTIS (US Sales Only); INIS		DE94604654	
00646	19:1471	OSTI; NTIS (US Sales Only); INIS		DE94604543	
00647	19:1472	OSTI; NTIS (US Sales Only); INIS		DE94604544	
00648	19:211	OSTI; NTIS (US Sales Only); INIS		DE94604173	
00652	19:729	OSTI; NTIS (US Sales Only); INIS		DE94604602	
00653	19:2587	OSTI; NTIS (US Sales Only); INIS		DE94605039	
00657	19:743	OSTI; NTIS (US Sales Only); INIS		DE94604655	
00658	19:2618	OSTI; NTIS (US Sales Only); INIS		DE94604994	
00660	19:2734	OSTI; NTIS (US Sales Only); INIS		DE94605011	
00661	19:1283	OSTI; NTIS (US Sales Only); INIS		DE94604137	
00662	19:2190	OSTI; NTIS (US Sales Only); INIS		DE94604365	
00663	19:2167	OSTI; NTIS (US Sales Only); INIS		DE94604391	
00664	19:1154	OSTI; NTIS (US Sales Only); INIS		DE94604075	
00665	19:2619	OSTI; NTIS (US Sales Only); INIS		DE94604995	
00666	19:2191	OSTI; NTIS (US Sales Only); INIS		DE94604362	
00667	19:733	OSTI; NTIS (US Sales Only); INIS		DE94604568	
00668	19:712	OSTI; NTIS (US Sales Only); INIS		DE94604593	
00669	19:2192	OSTI; NTIS (US Sales Only); INIS		DE94604384	

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00671	19:1417	OSTI; NTIS (US Sales Only); INIS		DE94604532	
00672	19:171	OSTI; NTIS (US Sales Only); INIS		DE94604170	
00673	19:1284	OSTI; NTIS (US Sales Only); INIS		DE94604133	
00674	19:2168	OSTI; NTIS (US Sales Only); INIS		DE94604428	
00676	19:1418	OSTI; NTIS (US Sales Only); INIS		DE94604533	
00677	19:749	OSTI; NTIS (US Sales Only); INIS		DE94604578	
00680	19:694	OSTI; NTIS (US Sales Only); INIS		DE94604588	
00681	19:2169	OSTI; NTIS (US Sales Only); INIS		DE94604392	
00683	19:1285	OSTI; NTIS (US Sales Only); INIS		DE94604134	
00684	19:2170	OSTI; NTIS (US Sales Only); INIS		DE94604429	
00686	19:1887	OSTI; NTIS (US Sales Only); INIS		DE94604280	
00687	19:1613	OSTI; NTIS (US Sales Only); INIS		DE94604605	
00688	19:1976	OSTI; NTIS (US Sales Only); INIS		DE94604431	
00697	19:730	OSTI; NTIS (US Sales Only); INIS		DE94604603	
CONF-740807–		(13. air cleaning conference; San Francisco, CA (United States); 12-15 Aug 1974)			
1	19:1438	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93019316	MF-707
CONF-8804338–		(1. Italian workshop on parallel architectures and neural networks; Salerno (Italy); 27-29 Apr 1988)			
1	19:2830	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000318	MF-405
CONF-880540–		(15. annual international symposium on computer architecture; No City Given, HI (United States); 30 May - 2 jun 1988)			
4	19:2831	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000317	MF-405
CONF-880867–		(24. international Rochester conference on high energy physics; Munich (Germany); 4-10 Aug 1988)			
28	19:2378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019136	MF-414
CONF-8811217–		(Maroco-French cooperation in nuclear safety; Rabat (Morocco); 28 Nov - 3 dec 1988)			
	19:783	*See* INIS-mf–13522			
CONF-8903284–		(2. Symposium on energy conservation in urban planning; Moscow (Russian Federation); 14-15 Mar 1989)			
	19:962	*See* VTT-SYMP–112			
CONF-8908302–		(NEMO 89: 2. national seminar on advanced energy systems; Kirkkonummi (Finland); 24 Aug 1989)			
	19:578	*See* TKK-NEMO–12			
CONF-8909270–		(3. workshop on high energy spin physics; Protvino (USSR); 5-7 Sep 1989)			
	19:2279	*See* INIS-SU–327/A			
CONF-8912172–		(International symposium on uranium technology; Bombay (India); 13-15 Dec 1989)			
	19:165	*See* INIS-mf–13386			
	19:166	*See* INIS-mf–13387			
CONF-8912178–		(Conference on decentralized systems; Lyon (France); 11-13 Dec 1989)			
1	19:2832	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000321	MF-405
CONF-9002161–		(4. Jorge Andre Swieca summer school; Sao Paulo (Brazil); 5-16 Feb 1990)			
	19:2418	*See* INIS-BR–3174			
CONF-9002221–		(55. National conference of the Israel chemical society; Tel-Aviv (Israel); 11-12 Feb 1990)			
	19:1146	*See* INIS-mf–13442			
CONF-9004372–		(American Nuclear Society topical meeting on advances in mathematics, computations and nuclear physics; Pittsburgh, PA (United States); 28 Apr - 1 may 1990)			
1	19:2529	*See* WAPD-T–2954			
CONF-900608–		(American Nuclear Society (ANS) annual meeting; Nashville, TN (United States); 10-14 Jun 1990)			
58	19:661	*See* WAPD-T–2943			
CONF-900846–		(International symposium to commemorate the 50th anniversary of discovery of transuranium elements; Washington, DC (United States); 26-31 Aug 1990)			
	19:1281	*See* CEA-CONF–11422			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-900874–		(1990 international conference on parallel processing; St. Charles, IL (United States); 13-17 Aug 1990)			
5	19:2833	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000324	MF-405
CONF-900924–		(9. international symposium on high energy spin-physics; Bonn (Germany); 10-15 Sep 1990)			
17	19:2570	*See* SLAC-PUB–5298			
CONF-900992–		(CONPAR '90: international conference on parallel processing; Zurich (Switzerland); 10-13 Sep 1990)			
3	19:2834	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000325	MF-405
CONF-9010546–		(2. international conference on landfill gas; Bournemouth (United Kingdom); 16-19 Oct 1990)			
1	19:525	*See* ENEA-RT-AMB–90-30			
CONF-9012164–		(Indo-Japan seminar on thorium utilization; Bombay (India); 10-13 Dec 1990)			
	19:726	*See* INIS-mf–13516			
CONF-901221–		(2. IEEE symposium on parallel and distributed processing; Dallas, TX (United States); 9-13 Dec 1990)			
2	19:2835	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000323	MF-405
CONF-910280–		(16. annual SAS users group international conference; New Orleans, LA (United States); 17-20 Feb 1991)			
5	19:984	*See* UCRL-JC–104909			
CONF-910311–		(42. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy; Chicago, IL (United States); 4-8 Mar 1991)			
3	19:1224	*See* WAPD-T–2941			
CONF-910414–		(International topical meeting on advances in mathematics, computation and reactor physics; Pittsburgh, PA (United States); 28 Apr - 2 may 1991)			
42	19:2528	*See* WAPD-T–2953			
CONF-9104425–		(5. international parallel processing symposium; Anaheim, CA (United States); 30 Apr - 2 may 1991)			
1	19:2836	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000322	MF-402
CONF-9105430–		(IOGCC/DOE oil and gas environmental workshop; Pittsburgh, PA (United States); 16 May 1991)			
Summ.	19:92	*See* LA-SUB–93-274(5/91)			
CONF-9106235–		(11. Department of Energy workshop on personnel neutron dosimetry; Las Vegas, NV (United States); 4-7 Jun 1991)			
7	19:2193	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002197	MF-407
CONF-9106436–		(U.S. symposium on rock mechanics; Norman, OK (United States); Jun 1991)			
1	19:1114	*See* ANL/RE/CP–80143			
CONF-9106442–		(Conference on parallel architectures and languages; Eindhoven (Netherlands); Jun 1991)			
1	19:2837	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000319	MF-405
CONF-9106445–		(2. INR (Kiev's) international school on nuclear physics; Kiev (Ukraine); 25 Jun - 2 jul 1991)			
	19:2482	*See* INIS-UA–0001			
CONF-910739–		(28. American Society of Mechanical Engineers (ASME) national heat transfer conference; Minneapolis, MN (United States); 26-31 Jul 1991)			
30	19:660	*See* WAPD-T–2942			
CONF-910808–		(5. international symposium on environmental degradation of materials in nuclear power systems - water reactors; Monterey, CA (United States); 25-29 Aug 1991)			
10	19:710	*See* WAPD-T–2958			
CONF-910864–		(4. international conference on hadron spectroscopy; College Park, MD (United States); 12-16 Aug 1991)			
15	19:2355	*See* BNL–49445			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9109109–		(4. international workshop on targetry and target chemistry; Villigen (Switzerland); 9-12 Sep 1991)			
	19:1303	*See* PSI-PROC–92-01			
CONF-9109510–		(Jets in extragalactic radio sources; Rinberg Castle (Germany); 22-28 Sep 1991)			
1	19:2322	*See* UCRL-JC–114095			
CONF-9110515–		(IOGCC/DOE oil and gas environmental workshop; Bakersfield, CA (United States); 10-11 Oct 1991)			
Summ.	19:93	*See* LA-SUB–93-274(10/91)			
CONF-9111331–		(19. National Institute of radiological Sciences seminar on environmental research; Chiba (Japan); 28-29 Nov 1991)			
	19:2111	*See* NIRS-M–92			
CONF-9112147–		(DAE symposium on nuclear physics; Bombay (India); 26-30 Dec 1991)			
	19:2419	*See* INIS-mf–13388			
CONF-911287–		(International Energy Agency (IEA) experts meeting on wind turbine aerodynamics; Stuttgart (Germany); 3-4 Dec 1991)			
	19:624	*See* ETSU-N–121			
CONF-911296–		(14. international conference on laser and applications; San Diego, CA (United States); 8-13 Dec 1991)			
11-App.4	19:2519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017912	MF-408
CONF-9201162–		(Cardiovascular health and disease in women conference; Bethesda, MD (United States); 22-24 Jan 1992)			
1	19:2164	*See* LBL–34127			
CONF-9204148–		(33. joint The Institute of Management Science/Operation Research Society of America (TIMS/ORSA) national meeting; Orlando, FL (United States); 29 Apr - 8 may 1992)			
6	19:1871	*See* UCRL-JC–113621			
CONF-9204170–		(Neutral particle beam technical symposium and scientific exchange; Argonne, IL (United States); 28 Apr - 1 may 1992)			
4	19:1510	*See* ANL/EP/CP–80799			
CONF-9204201–		(22. actinides meeting; Meribel (France); 22-25 Apr 1992)			
	19:209	*See* CEA-CONF–11417			
CONF-9204265–		(Migration of radionuclides in the geosphere meeting; Brussels (Belgium); 9-10 Apr 1992)			
	19:383	*See* EUR–14690			
CONF-9205305–		(Worldwide achievement in public and occupational health protection against radiation (IRPA 8); Montreal (Canada); 17-23 May 1992)			
	19:755	*See* CEA-CONF–11522			
	19:1900	*See* CEA-CONF–11501			
	19:1901	*See* CEA-CONF–11514			
	19:1902	*See* CEA-CONF–11519			
	19:1975	*See* CEA-CONF–11518			
	19:2188	*See* CEA-CONF–11502			
CONF-9205318–		(22. Conference on physics of charged particle interaction with crystals; Moscow (Russian Federation); 25-27 May 1992)			
	19:2521	*See* INIS-SU–340/A			
CONF-9205374–		(57. Cold Spring Harbor symposium on quantitative biology: The cell surface; Cold Spring Harbor, NY (United States); 27 May - 3 jun 1992)			
Absts.	19:2133	*See* DOE/ER/61420–1			
CONF-9205375–		(Meeting on the radioecological conditions of the Rhone River and its valley; Avignon (France); 23 May 1992)			
	19:2104	*See* CEA-CONF–11503			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-920574–		(6. international symposium on resonance ionization spectroscopy (RIS) and its applications; Santa Fe, NM (United States); 24-29 May 1992)			
16	19:2544	*See* UCRL-JC–109494			
CONF-9206102–		(International joint conference on neural networks; Baltimore, MD (United States); 7-11 Jun 1992)			
6	19:2882	*See* UCRL-JC–109597			
CONF-9206165–		(European simulation multiconference; York (United Kingdom); 1-4 Jun 1992)			
2	19:813	*See* ETDE-IT–93-198			
CONF-920638–		(19. Institute of Electrical and Electronic Engineers (IEEE) international conference on plasma science; Tampa, FL (United States); 1-3 Jun 1992)			
	19:2756	*See* IPPCZ–321			
CONF-9206385–		(SFPE symposium on the preparation of fire hazards analysis for DOE facilities; Idaho Falls, ID (United States); 23-24 Jun 1992)			
2	19:2249	*See* WSRC-MS–92-235			
CONF-9206403–		(Wind turbine noise workshop; Harwell (United Kingdom); 30 Jun 1992)			
	19:614	*See* ETSU-N–123			
CONF-9206407–		(IGAC/GEIA workshop on global emission inventory; Lillestroem (Norway); 22-24 Jun 1992)			
	19:1952	*See* NILU-OR–67/92			
CONF-9206411–		(Specialist Meeting on simulators and plant analyzers; Lappeenranta (Finland); 9 Jun 1992)			
	19:693	*See* CEA-CONF–11504			
CONF-9206413–		(Proceedings Wind Energy R and D contractor Meeting; Alghero (Italy); 3-5 Jun 1992)			
	19:643	*See* EUR–14607			
CONF-920792–		(37. annual Society of Photo-Optical Instrumentation Engineers (SPIE) international symposium on optical and optoelectronic applied science and engineering; San Diego, CA (United States); 19-24 Jul 1992)			
66	19:1803	*See* UCRL-JC–108983			
CONF-920813–		(Joint Varenna-Lausanne international workshop on theory of fusion plasmas; Varenna (Italy); 24-28 Aug 1992)			
	19:2693	*See* LRP–462/92			
CONF-9208188–		(North Atlantic Treaty Organization/Advanced Studies Institute (NATO/ASI) summer school: from statistical physics to statistical inference and back; Cargese (France); 31 Aug - 12 sep 1992)			
3	19:2792	*See* UCRL-JC–113505			
CONF-920823–		(22. Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) nuclear air cleaning and treatment conference; Denver, CO (United States); 24-27 Aug 1992)			
	19:1373	*See* CEA-CONF–11505			
CONF-9208237–		(Relativistic and electron correlation effects in molecules and solids; Vancouver (Canada); 9-22 Aug 1992)			
2	19:2531	*See* ANL/CHM/CP–80473			
CONF-9208242–		(11. European meeting on genetic transformation, DNA transfer and gene expression in microorganisms; Budapest (Hungary); 23-27 Aug 1992)			
1	19:2129	*See* BNL–49412			
CONF-920923–		(2. world renewable energy congress; Reading (United Kingdom); 13-18 Sep 1992)			
1	19:581	*See* ETDE-IT–93-241			
CONF-9209239–		(Workshop on nuclear physics in the universe; Oak Ridge, TN (United States); 24-26 Sep 1992)			
8	19:2304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000482	MF-413

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9209306--		(International School of Nuclear Physics on heavy ion collisions at intermediate and relativistic energies; Sicily (Italy); 7-16 Sep 1992)			
3	19:2517	*See* UCRL-JC--112168			
CONF-9209391--		(Gif school; Gif-sur-Yvette (France); 14 Sep 1992)			
	19:2444	*See* LAL--93-02			
CONF-9209396--		(14. international conference on plasma physics and controlled nuclear fusion research; Wuerzburg (Germany); 30 Sep - 7 oct 1992)			
	19:2694	*See* NIFS--167			
	19:2695	*See* NIFS--170			
	19:2696	*See* NIFS--176			
	19:2697	*See* NIFS--179			
	19:2698	*See* NIFS--181			
	19:2699	*See* NIFS--184			
	19:2700	*See* NIFS--185			
	19:2701	*See* NIFS--187			
	19:2702	*See* NIFS--198			
	19:2774	*See* NIFS--177			
	19:2775	*See* NIFS--180			
	19:2776	*See* NIFS--186			
CONF-9209407--		(Waves and particles in light and matter conference; Trani (Italy); 24-30 Sep 1992)			
1	19:2313	*See* LBL--34575			
CONF-9209408--		(Genetics and molecular biology of breast cancer symposium; Cold Spring Harbor, NY (United States); 2-6 Sep 1992)			
Absts.	19:2163	*See* DOE/ER/61442--1			
CONF-9209413--		(16. international conference on nuclear tracks in solids; Beijing (China); 7-11 Sep 1992)			
	19:1640	*See* INIS-mf--13731			
CONF-9209414--		(11. symposium of microdosimetry; Gatlinnburg, TN (United States); 13-18 Sep 1992)			
1	19:764	*See* ETDE-IT--93-221			
CONF-9209415--		(1992 international conference on advaced and laser technologies; Moscow (Russian Federation); 8-11 Sep 1992)			
1	19:2588	*See* ENEA-RT-INN--92-42			
CONF-920948--		(6. international conference on physics of highly charged ions; Manhattan, KS (United States); 28 Sep - 2 oct 1992)			
21	19:2550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040282	MF-411
CONF-920970--		(3. conference on evolution of microstructure in metals during irradiation; Chalk River (Canada); 29 Sep - 2 oct 1992)			
9	19:1038	*See* PNL-SA--20214			
CONF-921003--		(ANP'92: international conference on design and safety of advanced nuclear power plants; Tokyo (Japan); 25-29 Oct 1992)			
13	19:781	*See* ETDE-IT--93-235			
14	19:780	*See* ETDE-IT--93-234			
CONF-921006--		(62. annual meeting of the Society of Exploration Geophysicists; New Orleans, LA (United States); 25-29 Oct 1992)			
2	19:2083	*See* UCRL-JC--110327			
CONF-9210121--		(Workshop on the production and use of intense radioactive ion beams for the IsoSpin Laboratory; Oak Ridge, TN (United States); 7-10 Oct 1992)			
	19:2299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000630	MF-410
7	19:2298	*See* ANL/PHY/CP--78785			
8	19:2425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002452	MF-413
CONF-9210246--		(4. annual accelerator instrumentation workshop; Berkeley, CA (United States); 27-30 Oct 1992)			
20	19:1548	*See* LBL--34238			
CONF-9210290--		(5. users meeting for the Advanced Photon Source (APS); Argonne, IL (United States); 14-15 Oct 1992)			
	19:2571	*See* ANL/APS/CP--5			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9210300–		(EC 8. joint workshop on electron cyclotron emission and electron cyclotron heating; Gut Ising (Germany); 19-21 Oct 1992)			
	19:2642	*See* EUR-CEA-FC–1474			
CONF-9210400–		(Grain boundary and interface phenomena workshop; Berkeley, CA (United States); 16-21 Oct 1992)			
1	19:1141	*See* UCRL-JC–113794			
CONF-9210411–		(Joint IAEA/CSNI specialists' meeting on fracture mechanics verification by large-scale testing; Oak Ridge, TN (United States); 26-29 Oct 1992)			
	19:736	*See* NUREG/CP–0131			
CONF-9210412–		(Congress Euromembrane 92; Paris (France); 5-8 Oct 1992)			
	19:1611	*See* CEA-CONF–11512			
CONF-921079–		(Visualization 1992; Boston, MA (United States); 19-23 Oct 1992)			
6-Rev.1	19:2881	*See* UCRL-JC–108648-Rev.1			
CONF-9211112–		(Conference on managing nuclear weapons in a changing world; Livermore, CA (United States); 17-18 Nov 1992)			
2	19:982	*See* UCRL-JC–114402			
CONF-921114–		(Fuel cell seminar; Tucson, AZ (United States); 29 Nov - 2 dec 1992)			
6	19:887	*See* ETDE-IT–93-240			
CONF-9211224–		(4. ATIG symposium; Naples (Italy); 25-27 Nov 1992)			
20	19:657	*See* ETDE-IT–93-233			
21	19:656	*See* ETDE-IT–93-232			
22	19:886	*See* ETDE-IT–93-231			
23	19:655	*See* ETDE-IT–93-230			
23	19:885	*See* ETDE-IT–93-228			
24	19:654	*See* ETDE-IT–93-229			
26	19:135	*See* ETDE-IT–93-227			
27	19:927	*See* ETDE-IT–93-226			
28	19:138	*See* ETDE-IT–93-225			
29	19:157	*See* ETDE-IT–93-224			
30	19:155	*See* ETDE-IT–93-223			
CONF-9211266–		(1992 annual meeting of the American Society of Human Genetics (ASHG); San Francisco, CA (United States); 6-14 Nov 1992)			
1	19:2138	*See* LBL–33745			
CONF-9211267–		(9. international congress of the chemistry of cement; New Delhi (India); 23-28 Nov 1992)			
1	19:1115	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040835	MF-404
CONF-9211268–		(Advances in superplasticity and superplastic forming; Chicago, IL (United States); 1-5 Nov 1992)			
1	19:1105	*See* UCRL-JC–112108			
CONF-9211272–		(Use of digital geographical databases in hydrological modeling. Nordic workshop; Linkoeping (Sweden); 9-10 Nov 1992)			
	19:2263	*See* NHP–32			
CONF-9211275–		(1. National Forum of Science and Technology on Health; Caxambu (Brazil); 20-24 Nov 1992)			
	19:2142	*See* INIS-BR–3148			
CONF-921188–		(Government microcircuit applications conference: microelectronics in the new world order; Las Vegas, NV (United States); 9-12 Nov 1992)			
2	19:1454	*See* UCRL-JC–110367			
3	19:2883	*See* UCRL-JC–110366			
CONF-921261–		(3. symposium on particles, strings and cosmology and the 16th Texas symposium on relativistic astrophysics conference; Berkeley, CA (United States); 13-18 Dec 1992)			
4	19:2414	*See* LBL–33677			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-921295–		(Automatic Identification Manufactures (AIM) USA Magnetic Stripe Technical Committee meeting; Ft. Myers, FL (United States); 1-2 Dec 1992)			
1	19:480	*See* SAND–92-2587C			
CONF-921299–		(37. Brazilian Congress on Geology.; Sao Paulo (Brazil); 9-15 Dec 1992)			
	19:1175	*See* INIS-BR–3177			
	19:1176	*See* INIS-BR–3178			
	19:1177	*See* INIS-BR–3179			
	19:1178	*See* INIS-BR–3180			
	19:1179	*See* INIS-BR–3181			
	19:1180	*See* INIS-BR–3182			
	19:1181	*See* INIS-BR–3184			
	19:1182	*See* INIS-BR–3187			
	19:1183	*See* INIS-BR–3188			
	19:1184	*See* INIS-BR–3189			
	19:1185	*See* INIS-BR–3190			
	19:1186	*See* INIS-BR–3191			
	19:1187	*See* INIS-BR–3192			
	19:1188	*See* INIS-BR–3193			
	19:1189	*See* INIS-BR–3194			
	19:1190	*See* INIS-BR–3195			
	19:1191	*See* INIS-BR–3196			
	19:1192	*See* INIS-BR–3197			
	19:1193	*See* INIS-BR–3198			
	19:1194	*See* INIS-BR–3199			
	19:1195	*See* INIS-BR–3200			
	19:2007	*See* INIS-BR–3175			
	19:2008	*See* INIS-BR–3176			
	19:2009	*See* INIS-BR–3183			
	19:2010	*See* INIS-BR–3185			
	19:2011	*See* INIS-BR–3186			
	19:2012	*See* INIS-BR–3201			
	19:2110	*See* INIS-BR–3202			
CONF-9301129–		(Socioeconomic aspects of disasters in Latin America; San Jose (Costa Rica); 26 Jan 1993)			
1	19:2244	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041049	MF-900
CONF-9301130–		(OELASE '93: International symposium on lasers, sensors, applications; Los Angeles, CA (United States); 18-22 Jan 1993)			
	19:172	*See* CEA-CONF–11371			
	19:173	*See* CEA-CONF–11372			
	19:174	*See* CEA-CONF–11373			
	19:175	*See* CEA-CONF–11374			
	19:2538	*See* CEA-CONF–11378			
CONF-930121–		(18. annual workshop on geothermal reservoir engineering; Stanford, CA (United States); 26-28 Jan 1993)			
5	19:605	*See* LBL–33727			
CONF-930159–		(OE/LASE '93: International Society for Optical Engineering (SPIE) conference; Los Angeles, CA (United States); 13-23 Jan 1993)			
54	19:1034	*See* LBL–33786			
55	19:2789	*See* UCRL-JC–112742			
57	19:1222	*See* UCRL-JC–111288			
58	19:2788	*See* UCRL-JC–111445			
CONF-930169–		(16. nuclear physics symposium; Oaxtepec (Mexico); 5-8 Jan 1993)			
4	19:2461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000495	MF-413
CONF-930173–		(HIPAGS 93: workshop on heavy ion physics at the alternating gradient synchrotron; Cambridge, MA (United States); 14-17 Jan 1993)			
12	19:2518	*See* UCRL-JC–112925			
CONF-9302103–		(122. annual meeting of the Minerals, Metals and Materials Society (TMS); Denver, CO (United States); 21-25 Feb 1993)			
5	19:1062	*See* UCRL-JC–114114			
6	19:1089	*See* IS-M–766			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9302119–		(3. international symposium on radioiodinated fatty acids; Kyoto (Japan); 10-11 Feb 1993)			
2	19:2141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000491	MF-408
CONF-9302137–		(6. annual workshop on recent developments in computer simulation studies in condensed matter physics; Athens, GA (United States); 22-26 Feb 1993)			
2	19:2601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000489	MF-413
CONF-930269–		(Computational accelerator physics conference (CAP93); Pleasanton, CA (United States); 22-26 Feb 1993)			
22	19:1553	*See* SLAC-PUB–6085			
CONF-930304–		(205. American Chemical Society national meeting; Denver, CO (United States); 28 Mar - 2 apr 1993)			
32	19:516	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041044	MF-242
CONF-9303111–		(4. annual workshop on management in basic applied research environments; Stanford, CA (United States); 3-4 Mar 1993)			
Suppl.	19:855	*See* NREL/CP–320-5717			
CONF-9303119–		(5. short wavelength: physics with intense laser pulses; San Diego, CA (United States); 29-31 Mar 1993)			
5	19:2320	*See* UCRL-JC–113294			
CONF-9303122–		(3. ARM science team meeting; Norman, OK (United States); 1-5 Mar 1993)			
5	19:1896	*See* ANL/ER/CP–79787			
CONF-9303126–		(4. international workshop on the physics of compressible turbulent mixing; Cambridge (United Kingdom); 29 Mar - 1 apr 1993)			
10	19:1428	*See* UCRL-JC–114331			
CONF-930317–		(Conference on critical issues in the development of high temperature structural materials; Kona, HI (United States); 7-12 Mar 1993)			
2	19:1059	*See* UCRL-JC–113795			
CONF-9303172–		(1993 Rencontres de Physique de La Vallee D'Aoste; LaThuile (Italy); 8-13 Mar 1993)			
4	19:2399	*See* SLAC-PUB–6109			
5	19:2401	*See* SLAC-PUB–6285			
CONF-9303198–		(National Center for Advanced Information Components Manufacturing (NCAICM) workshop; Albuquerque, NM (United States); 30-31 Mar 1993)			
6	19:1458	*See* UCRL-JC–113483			
CONF-9303220–		(Workshop on measurement quality assurance for ionizing radiation; Washington, DC (United States); 16-18 Mar 1993)			
1	19:2233	*See* PNL-SA–22100			
CONF-9303221–		(Probabilistic safety assessment and management (PSAM) conference; San Diego, CA (United States); 20-24 Mar 1993)			
2	19:1857	*See* UCRL-JC–114201			
3	19:1872	*See* UCRL-JC–115270			
4	19:748	*See* ANL/RA/CP–79576			
CONF-9303225–		(CHAMMP science meeting; Monterey, CA (United States); 15-17 Mar 1993)			
1	19:2276	*See* UCRL-JC–115013			
CONF-9303228–		(Workshop on HERA: the new frontier for QCD; Durham (United Kingdom); 22 Mar 1993)			
	19:2416	*See* RAL–93-027			
CONF-930324–		(Symposium on improved technology for fossil power plants: new and retrofit applications; Washington, DC (United States); 1-3 Mar 1993)			
2	19:59	*See* ETDE-IT–93-222			
CONF-930363–		(28. conference on quantum chromodynamics and high energy hadronic interactions; Les Arcs (France); 13-27 Mar 1993)			
8	19:2400	*See* SLAC-PUB–6225			
10	19:2382	*See* FNAL/C–93/180-E			
11	19:2389	*See* FNAL/C–93/273-E			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-930367–		(Conference on spectroscopies in novel superconductors; Santa Fe, NM (United States); 17-19 Mar 1993)			
9	19:1075	*See* ANL/MSD/CP–80681			
10	19:1104	*See* UCRL-JC–112045			
CONF-930385–		(1993 oil heat technology conference and workshop; Upton, NY (United States); 25-26 Mar 1993)			
	19:96	*See* BNL–52392			
CONF-930389–		(Future directions in particle and nuclear physics at multi-GeV hadron beam facilities; Upton, NY (United States); 4-6 Mar 1993)			
22	19:2403	*See* BNL–49416			
23	19:2383	*See* FNAL/C–93/197			
CONF-930403–		(5. topical meeting on robotics and remote systems; Knoxville, TN (United States); 26-29 Apr 1993)			
54	19:1374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002456	MF-906; MF-940
CONF-930405–		(Spring meeting of the Materials Research Society; San Francisco, CA (United States); 12-16 Apr 1993)			
5	19:1040	*See* SAND–92-2779C			
38-Rev.1	19:1054	*See* UCRL-JC–112347-Rev.1			
39	19:1112	*See* ANL/MSD/CP–79238			
40	19:1818	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040601	MF-404
41	19:1060	*See* UCRL-JC–113802			
42	19:1057	*See* UCRL-JC–113778			
43	19:1061	*See* UCRL-JC–113810			
44	19:1063	*See* UCRL-JC–114157			
45	19:1053	*See* UCRL-JC–112054			
46	19:1058	*See* UCRL-JC–113779			
47	19:1256	*See* UCRL-JC–114161			
CONF-930408–		(International high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993)			
83	19:344	*See* UCRL-JC–113748			
CONF-9304123–		(8. Korean Atomic Industrial Forum/Korean Nuclear Society/OKAEA annual conference; Seoul (Korea, Republic of); 20-21 Apr 1993)			
2	19:782	*See* ETDE-IT–93-242			
CONF-9304145–		(International workshop on low energy muon science (LEMS '93); Santa Fe, NM (United States); 4-8 Apr 1993)			
3	19:1031	*See* LA-UR–93-3473			
CONF-9304146–		(Alloy 600 experts meeting; Warrenton, VA (United States); 5-9 Apr 1993)			
3	19:1017	*See* KAPL–4760			
CONF-9304181–		(IAEA's coordinated research on activation cross sections for the generation of long-lived and radionuclides of importance in fusion reactor technology; San Diego, CA (United States); 29-30 Apr 1993)			
2	19:2794	*See* UCRL-JC–114185			
CONF-9304189–		(1993 joint Army, Navy, NASA, Air Force (JANNAF) nondestructive evaluation subcommittee meeting; Livermore, CA (United States); 26-28 Apr 1993)			
2	19:1805	*See* UCRL-JC–113741			
CONF-930419–		(International conference on metallurgical coatings and thin films; San Diego, CA (United States); 19-23 Apr 1993)			
5	19:1138	*See* UCRL-JC–111960			
CONF-9304190–		(Western Social Science Association meeting; Corpus Christi, TX (United States); 20-24 Apr 1993)			
1	19:242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019282	MF-814
CONF-9304191–		(International symposium on high-T_c superconductivity and its applications; Cairo (Egypt); 4-16 Apr 1993)			
2	19:2602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019198	MF-411

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3	19:1079	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019200	MF-404
4	19:2603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019197	MF-411
CONF-9304197–		(International symposium on integrated ferroelectrics; Colorado Springs, CO (United States); 19-21 Apr 1993)			
2	19:1132	*See* SAND–93-0547C			
CONF-9304201–		(Sybase user's conference; San Jose, CA (United States); 28 Apr 1993)			
1	19:2871	*See* PNL-SA–21755			
CONF-9304204–		(Biological effects of low level exposures to chemicals and radiation; Washington, DC (United States); 26-27 Apr 1993)			
1	19:2234	*See* PNL-SA–22123			
CONF-9304206–		(HAZMACON 93: hazardous materials conference; San Jose, CA (United States); 6-8 Apr 1993)			
1	19:2890	*See* UCRL-JC–111732			
CONF-9304210–		(Workshop on program for elimination of requirements marginal to safety; Bethesda, MD (United States); 27-28 Apr 1993)			
	19:790	*See* NUREG/CP–0129			
CONF-9304211–		(European Safeguard and Research Development Association/non-destructive analysis (ESARDA/NDA) workshop on passive neutron; Ispra (Italy); 20-23 Apr 1993)			
1	19:485	*See* UCRL-JC–112888			
CONF-9304213–		(Actinides meeting; Buehl (Germany); 20-23 Apr 1993)			
	19:210	*See* CEA-CONF–11456			
CONF-9304218–		(16. symposium on plasma physics and technology; Prague (Czech Republic); 27-29 Apr 1993)			
	19:2651	*See* INIS-mf–13714			
CONF-9304219–		(Maintenance implementation plan workshop; Oak Ridge, TN (United States); 27-29 Apr 1993)			
1	19:489	*See* WINCO–11949			
CONF-930433–		(55. annual American power conference; Chicago, IL (United States); 13-15 Apr 1993)			
8	19:50	*See* DOE/MC/24132–93/C0234			
CONF-930438–		(95. annual meeting of the American Ceramic Society; Cincinnati, OH (United States); 18-22 Apr 1993)			
30	19:368	*See* WINCO–11933			
CONF-930443–		(1. international global atmospheric chemistry project conference; Elat (Israel); 18-22 Apr 1993)			
1	19:1969	*See* UCRL-JC–112273			
CONF-930445–		(Society of Photo-Optical Instrumentation Engineers (SPIE) OE/aerospace science and sensing meeting; Orlando, FL (United States); 11-16 Apr 1993)			
25	19:1398	*See* UCRL-JC–113437			
CONF-930449–		(International workshop on physics and instrumentation at future linear colliders; Kona, HI (United States); 26-30 Apr 1993)			
3	19:1467	*See* SLAC-PUB–6264			
5	19:2402	*See* SLAC-PUB–6314			
6	19:1486	*See* SLAC-PUB–6315			
7	19:2371	*See* ANL-HEP-CP–93-68			
CONF-930483–		(9. waste minimization and pollution prevention conference; San Francisco, CA (United States); 13-15 Apr 1993)			
14	19:2891	*See* UCRL-JC–113691			
CONF-930484–		(11. Geothermal program review: geothermal energy - the environmentally responsible energy technology for the nineties; Berkeley, CA (United States); 27-29 Apr 1993)			
	19:588	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001714	MF-250

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CONF-930493–		(11. Society of Photo-Optical Instrumentation Engineering (SPIE) applications of artificial intelligence; Orlando, FL (United States); 12-16 Apr 1993)			
2	19:1884	*See* UCRL-JC–113499			
CONF-930511–		(International particle accelerator conference; Washington, DC (United States); 17-20 May 1993)			
254	19:1526	*See* DOE/ER/40150–215			
260	19:1525	*See* DOE/ER/40150–213			
353-Rev.	19:1547	*See* LBL–33290-Rev.			
356	19:1487	*See* SSCL-Preprint–470			
405	19:1500	*See* SLAC-PUB–6118			
415	19:1499	*See* SLAC-PUB–6108			
416	19:1498	*See* SLAC-PUB–6102			
417	19:1480	*See* SLAC-PUB–6103			
424	19:1552	*See* SLAC-PUB–6080			
428	19:1503	*See* SLAC-PUB–6200			
430	19:1598	*See* SLAC-PUB–6254			
439	19:1569	*See* SLAC-PUB–6211			
44	19:1597	*See* SLAC-PUB–6216			
440	19:1567	*See* SLAC-PUB–6206			
443	19:1568	*See* SLAC-PUB–6209			
446	19:1504	*See* SLAC-PUB–6215			
449	19:1554	*See* SLAC-PUB–6145			
450	19:1555	*See* SLAC-PUB–6149			
451	19:1481	*See* SLAC-PUB–6150			
452	19:1566	*See* SLAC-PUB–6198			
453	19:1596	*See* SLAC-PUB–6197			
454	19:1483	*See* SLAC-PUB–6183			
456	19:1484	*See* SLAC-PUB–6185			
458	19:1485	*See* SLAC-PUB–6192			
462	19:1557	*See* SLAC-PUB–6155			
463	19:1482	*See* SLAC-PUB–6156			
467	19:1558	*See* SLAC-PUB–6166			
468	19:1559	*See* SLAC-PUB–6168			
469	19:1501	*See* SLAC-PUB–6171			
471	19:1561	*See* SLAC-PUB–6177			
472	19:1562	*See* SLAC-PUB–6178			
473	19:1502	*See* SLAC-PUB–6179			
474	19:1563	*See* SLAC-PUB–6180			
475	19:1564	*See* SLAC-PUB–6181			
476	19:1565	*See* SLAC-PUB–6182			
477	19:1556	*See* SLAC-PUB–6151			
485	19:1473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000486	MF-414
486	19:1529	*See* FNAL/C–93/227			
489	19:1530	*See* FNAL/C–93/229			
493	19:2735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001849	MF-421
CONF-9305134–		(11. symposium on energy engineering sciences; Argonne, IL (United States); 3-5 May 1993)			
3-App.A	19:1811	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019682	MF-406
CONF-9305136–		(International symposium on heavy ion fusion; Frascati (Italy); 25-28 May 1993)			
13	19:2771	*See* LBL–34107			
15	19:2793	*See* UCRL-JC–114043			
CONF-9305155–		(Workshop on high intensity electron sources; Legnaro (Italy); 24-28 May 1993)			
1	19:1571	*See* SLAC-PUB–6273			
2	19:1560	*See* SLAC-PUB–6172			
CONF-9305159–		(Optical Society of America (OSA) topical meeting on soft x-ray projection lithography; Monterey, CA (United States); 10-12 May 1993)			
8	19:2547	*See* UCRL-JC–114072			
9	19:1460	*See* UCRL-JC–114074			
CONF-9305175–		(Individual monitoring of ionizing radiation: the impact of recent ICRP and ICRU publications; Villigen (Germany); 5-7 May 1993)			
3	19:2198	*See* ETDE-IT–93-243			

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CONF-9305177--		(12. International collaboration of advanced neutron sources meeting (ICANS); Abingdon (United Kingdom); 24-28 May 1993)			
13	19:1593	*See* LA-UR-93-2941			
CONF-9305199--		(Gravity and relativistic astrophysics; Waterloo (Canada); 13-15 May 1993)			
2	19:2333	*See* FNAL/C-93/196-A			
CONF-9305210--		(9. International Atomic Energy Agency (IAEA) workshop on stellarators; Garching (Germany); 10-14 May 1993)			
2	19:2736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017775	MF-420
4	19:2620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000371	MF-420
5	19:2621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000485	MF-427
6	19:2622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000474	MF-422
CONF-9305215--		(IAEA specialists meeting on experience in ageing, maintenance and modernization of instrumentation and control systems for improving nuclear power plant availability; Rockville, MD (United States); 5-7 May 1993)			
2	19:750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000488	
CONF-9305235--		(International workshop/time reversal invariance and parity violation in neutron physics; Dubna (Russian Federation); 4-7 May 1993)			
4	19:2348	*See* LA-UR-93-3516			
CONF-9305268--		(Workshop in english on geostatistical simulations; Fontainebleau (France); 27 May 1993)			
1	19:2873	*See* SAND-93-0438C			
CONF-9305275--		(Office of Basic Energy Sciences (BES) workshop on rock fracture; Albuquerque, NM (United States); 13-14 May 1993)			
1	19:1142	*See* UCRL-JC-113806			
2	19:2275	*See* UCRL-JC-113803			
CONF-9305276--		(Electronics for future colliders; Chestnut Ridge, NY (United States); 4-5 May 1993)			
1	19:1795	*See* LA-UR-93-3021			
CONF-9305278--		(Halon alternatives technical working conference; Albuquerque, NM (United States); 11-13 May 1993)			
1	19:1960	*See* SAND-93-0449C			
CONF-9305280--		(JASOWIEC '93; Warsaw (Poland); 24-28 May 1993)			
1	19:1127	*See* LBL-34280			
CONF-9305282--		(Particle physics at the fermi scale workshop; Beijing (China); 27 May - 4 jun 1993)			
1	19:2368	*See* SLAC-PUB-6304			
CONF-9305283--		(9. target fabrication specialists meeting; Monterey, CA (United States); 9 May 1993)			
1	19:1133	*See* SAND-93-0998C			
2	19:2787	*See* SAND-93-1026C			
CONF-9305285--		(Theory Institute on combinatorial challenges in computational differentiation workshop; Argonne, IL (United States); 24-26 May 1993)			
1	19:2838	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000336	MF-905
CONF-9305289--		(Center for Nonlinear Studies international conference on modeling the forces of nature; Los Alamos, NM (United States); 17-21 May 1993)			
1	19:2261	*See* LA-UR-93-3330			
CONF-9305290--		(1993 industry technology; Kansas City, MO (United States); 5-8 May 1993)			
1	19:468	*See* WINCO-11955			
CONF-9305291--		(3. international conference on radioactive nuclear beams; Upton, NY (United States); 24-27 May 1993)			
1	19:2456	*See* ANL/PHY/CP-80848			
CONF-9305296--		(Light emission from silicon; Strasbourg (France); 4-7 May 1993)			
	19:1120	*See* ETDE-IT-93-244			

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CONF-930537–		(5. annual international industrial symposium on the Super Collider and exhibition; San Francisco, CA (United States); 6-8 May 1993)			
105	19:1576	*See* SSCL-Preprint–486			
107	19:1521	*See* BNL–49344			
CONF-930540–		(23. Institute of Electrical and Electronic Engineers (IEEE) photovoltaic specialists conference; Louisville, KY (United States); 10-14 May 1993)			
11	19:557	*See* NREL/TP–411-5501			
CONF-930571–		(183. Electrochemical Society meeting; Honolulu, HI (United States); 16-21 May 1993)			
27	19:880	*See* BNL–49537			
28	19:1041	*See* SAND–93-1648C			
CONF-930572–		(12. annual international symposium on thermal treatment technologies - incineration conference; Knoxville, TN (United States); 3-7 May 1993)			
12	19:233	*See* ANL/CMT/CP–78043			
CONF-930601–		(American Nuclear Society (ANS) annual meeting; San Diego, CA (United States); 20-24 Jun 1993)			
29	19:280	*See* LA-UR–93-2895			
30	19:281	*See* LA-UR–93-2896			
33	19:1429	*See* WAPD-T–2984			
CONF-9306110–		(1993 predictive technology symposium and exhibition; Orlando, FL (United States); 22-24 Jun 1993)			
2	19:1841	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000481	
CONF-9306116–		(1. joint meeting of the Society of Engineering Science, Inc., and the American Society of Mechanical Engineering and the American Society of Civil Engineers; Charlottesville, VA (United States); 6-9 Jun 1993)			
2	19:206	*See* UCRL-JC–112821			
CONF-9306125–		(6. international conference on multiphoton processes; Quebec City (Canada); 25-30 Jun 1993)			
4	19:2535	*See* UCRL-JC–114857			
5	19:2546	*See* UCRL-JC–113549			
CONF-9306137–		(Geo confine 93: international symposium on geology and confinement of toxic wastes; Montpellier (France); 8-11 Jun 1993)			
1	19:350	*See* WHC-SA–1799			
CONF-9306148–		(Coal-fired power systems '93: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 28-30 Jun 1993)			
4	19:1118	*See* DOE/MC/27224–93/C0199			
9	19:1163	*See* DOE/MC/30126–93/C0200			
10	19:668	*See* DOE/METC/C–93/7092			
11	19:19	*See* DOE/METC/C–93/7095			
12	19:20	*See* DOE/METC/C–93/7096			
14	19:159	*See* DOE/METC/C–93/7091			
17	19:15	*See* DOE/MC/27233–93/C0209			
18	19:32	*See* DOE/MC/10637–93/C0204			
19	19:1162	*See* DOE/MC/29245–93/C0205			
20	19:56	*See* DOE/METC/C–93/7089			
21	19:664	*See* DOE/MC/25034–93/C0231			
23	19:926	*See* DOE/MC/28060–93/C0232			
24	19:1159	*See* DOE/MC/26040–93/C0220			
25	19:14	*See* DOE/MC/26372–93/C0202			
26	19:649	*See* DOE/MC/23170–93/C0228			
27	19:1161	*See* DOE/MC/29220–93/C0221			
28	19:9	*See* DOE/ER/80998–93/C0217			
31	19:1905	*See* DOE/MC/28016–93/C0222			
32	19:17	*See* DOE/MC/29246–93/C0219			
34	19:10	*See* DOE/MC/25003–93/C0218			
35	19:55	*See* DOE/MC/27364–93/C0229			
36	19:666	*See* DOE/MC/26042–93/C0213			
38	19:53	*See* DOE/MC/25177–93/C0226			
40	19:8	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000291	MF-106; MF-109

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41	19:651	*See* DOE/MC/26288–93/C0223			
42	19:667	*See* DOE/MC/27423–93/C0215			
43	19:663	*See* DOE/MC/24257–93/C0216			
44	19:11	*See* DOE/MC/25140–93/C0225			
45	19:662	*See* DOE/MC/21023–93/C0212			
46	19:646	*See* DOE/MC/21023–93/C0210			
47	19:665	*See* DOE/MC/25140–93/C0224			
48	19:647	*See* DOE/MC/21023–93/C0211			
CONF-930616–		(9. IEEE pulsed power conference; Albuquerque, NM (United States); 21-23 Jun 1993)			
33	19:953	*See* UCRL-JC–114976			
37	19:1455	*See* UCRL-JC–112023			
39	19:1456	*See* UCRL-JC–112339			
CONF-9306163–		(Items '93: an imaging technology conference and exposition; Washington, DC (United States); 6-10 Jun 1993)			
3	19:1840	*See* UCRL-JC–114065			
CONF-9306176–		(Workshop on physics at current accelerators and the supercollider; Argonne, IL (United States); 2-5 Jun 1993)			
7	19:2385	*See* FNAL/C–93/251			
8	19:2369	*See* ANL-HEP-CP–93-51			
9	19:2375	*See* BNL–49462			
10	19:2356	*See* BNL–49448			
11	19:2353	*See* ANL-HEP-CP–93-60			
CONF-9306188–		(1. workshop on RICH detectors; Bari (Italy); 1-5 Jun 1993)			
3	19:1799	*See* SLAC-PUB–6276			
CONF-9306201–		(Advance light source workshop on soft x-ray interferometry; Berkeley, CA (United States); 25 Jun 1993)			
	19:1796	*See* LBL–34541			
CONF-9306204–		(Project energy '93; Kansas City, MO (United States); 21-23 Jun 1993)			
3	19:612	*See* PNL-SA–23109			
4	19:2785	*See* PPPL-CFP–2985			
CONF-9306220–		(5. annual Association for Computing Machinery on parallel algorithms and architectures; Velen (Germany); 30 Jun - 2 jul 1993)			
1	19:2872	*See* SAND–93-0205C			
CONF-9306221–		(19 international conference on elastic and diffractive scattering (5th Blois workshop); Providence, RI (United States); 8-12 Jun 1993)			
3	19:2386	*See* FNAL/C–93/252-E			
4	19:2384	*See* FNAL/C–93/216-E			
6	19:2387	*See* FNAL/C–93/266			
7	19:2354	*See* ANL-HEP-CP–93-67			
8	19:2331	*See* ANL-HEP-CP–93-70			
CONF-9306222–		(17. annual Army environmental R&D symposium and 3rd USACE innovative technology transfer; Williamsburg, VA (United States); 22-24 Jun 1993)			
2	19:1944	*See* LA-UR–93-2201			
CONF-9306234–		(International Atomic Energy Agency (IAEA) coordinated research program (CRP2); Vienna (Austria); 23-25 Jun 1993)			
1	19:760	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018722	MF-1000
CONF-9306236–		(Monterey bio-computations conference; Monterey, CA (United States); 21-28 Jun 1993)			
1	19:2137	*See* LA-UR–93-2827			
CONF-9306237–		(8. conversation in the discipline biomolecular stereodynamics; Albany, NY (United States); Jun 1993)			
1	19:2131	*See* LA-UR–93-2936			
3	19:2132	*See* LA-UR–93-3013			
CONF-9306239–		(Western Economics Association (WEA) meeting; Lake Tahoe, NV (United States); 20-24 Jun 1993)			
1	19:822	*See* ANL/EAIS/CP–79749			

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CONF-9306245–		(North Atlantic Treaty Organization/Advanced Study Institute (NATO/ASI) conference on adaptive optics for astronomy; Cargese (France); 29 Jun - 9 aug 1993)			
1	19:1814	*See* UCRL-JC–114438			
CONF-9306249–		(Computational technology initiative for the oil and gas industry; Los Alamos, NM (United States); 20-24 Jun 1993)			
1	19:448	*See* UCRL-JC–113773			
CONF-9306250–		(Programming tools for parallel machines workshop; Otranto (Italy); 22-26 Jun 1993)			
1	19:2884	*See* UCRL-JC–114360			
CONF-9306253–		(Hadron collider workshop; Argonne, IL (United States); 2-5 Jun 1993)			
1	19:2415	*See* LBL–34232			
CONF-9306254–		(10. world hydrogen energy conference; Cocoa Beach, FL (United States); 20-24 Jun 1993)			
1	19:1829	*See* SAND–93-2155C			
CONF-9306255–		(1993 symposium on the foundations of modern physics; Cologne (Germany); 1-6 Jun 1993)			
1	19:2297	*See* SLAC-PUB–6010			
CONF-9306258–		(Workshop on B physics at hadron colliders; Snowmass, CO (United States); Jun 1993)			
1	19:2370	*See* ANL-HEP-CP–93-63			
2	19:2358	*See* FNAL/C–93/268			
4	19:2332	*See* ANL-HEP-CP–93-77			
CONF-9306260–		(Conference on exclusive reactions at high momentum transfer; Elba (Italy); 24-26 Jun 1993)			
1	19:2455	*See* ANL/PHY/CP–80692			
CONF-930631–		(1. international thermal energy congress; Marrakesh (Morocco); 6-10 Jun 1993)			
1	19:565	*See* ETDE-IT–93-236			
CONF-930636–		(10. international conference on ultra-relativistic nucleus-nucleus collisions; Borlaenge (Sweden); 20-24 Jun 1993)			
3	19:2515	*See* LA-UR–93-3429			
4	19:2514	*See* LA-UR–93-3334			
6	19:2374	*See* BNL–49453			
CONF-930637–		(13. international conference on particles and nuclei; Perugia (Italy); 27 Jun - 3 jul 1993)			
4	19:2454	*See* ANL/PHY/CP–79186			
5	19:2312	*See* LA-UR–93-3488			
6	19:2459	*See* BNL–49499			
7	19:2377	*See* BNL–49501			
8	19:2376	*See* BNL–49500			
9	19:2460	*See* BNL–49548			
10	19:2458	*See* BNL–49498			
CONF-930647–		(86. annual meeting and exhibition of the Air and Waste Management Association (AWMA); Denver, CO (United States); 13-18 Jun 1993)			
9	19:924	*See* ANL/ES/CP–78708			
CONF-930652–		(20. IEEE international conference on plasma sciences; Vancouver (Canada); 7-9 Jun 1993)			
3	19:508	*See* SAND–93-0728C			
CONF-930675–		(1993 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) summer meeting; Denver, CO (United States); 26-30 Jun 1993)			
7	19:1419	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019164	MF-350
CONF-930676–		(14. international conference of the International Association for the Advancement of High Pressure Science and Technology; Colorado Springs, CO (United States); 27 Jun - 2 jul 1993)			
22	19:1844	*See* LA-UR–93-2344			
23	19:1843	*See* LA-UR–93-2343			
51	19:2566	*See* SAND–93-1400C			
53	19:1069	*See* ANL/ET/CP–79207			
54	19:2274	*See* UCRL-JC–113406			
55	19:1056	*See* UCRL-JC–113300			

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56	19:2319	*See* UCRL-JC–112349			
57	19:1013	*See* IS-M–765			
58	19:1140	*See* UCRL-JC–113403			
59	19:1106	*See* UCRL-JC–113299			
60	19:1855	*See* UCRL-JC–113400			
CONF-930681–		(24. international annual conference of the Fraunhofer Institute of Chemical Technologies; Karlsruhe (Germany); 29 Jun - 2 jul 1993)			
3	19:1854	*See* UCRL-JC–113394			
CONF-930701–		(6. international conference on indoor air quality and climate; Helsinki (Finland); 4-8 Jul 1993)			
7	19:907	*See* LBL–34223			
CONF-930702–		(1993 pressure vessel and piping conference; Denver, CO (United States); 25-29 Jul 1993)			
51	19:1388	*See* SAND–92-2115C			
53	19:1379	*See* ETDE-IT–93-246			
54	19:1378	*See* ETDE-IT–93-239			
CONF-930703–		(International cryogenic engineering conference and international cryogenic materials conference; Albuquerque, NM (United States); 12-16 Jul 1993)			
9	19:2600	*See* ANL/MCT/CP–80158			
25	19:2741	*See* GA-A–21349			
28	19:1522	*See* BNL–49347			
34	19:2604	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041048	MF-220
35	19:2605	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000476	MF-220
36	19:2606	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000496	MF-220
CONF-930709–		(11. international conference on ion beam analysis; Balatonfured (Hungary); 5-9 Jul 1993)			
2	19:2583	*See* UCRL-JC–112793			
CONF-930710–		(Physics and chemistry of molecular and oxide superconductors; Eugene, OR (United States); 27-31 Jul 1993)			
1	19:1074	*See* ANL/MSD/CP–80635			
2	19:1098	*See* LBL–34523			
3	19:1076	*See* ANL/MSD/CP–80860			
4	19:1077	*See* ANL/MSD/CP–80962			
CONF-930711–		(18. international conference on the physics of electronic and atomic collisions; Aarhus (Denmark); 21-27 Jul 1993)			
	19:2616	*See* CEA-CONF–11380			
1	19:2590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041046	MF-423
4	19:2551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002459	MF-411
CONF-930712–		(ICACS: 15. international conference on atomic collision in solids; London (Canada); 26-30 Jul 1993)			
5	19:2596	*See* LA-UR–93-2790			
6	19:2586	*See* UCRL-JC–114718			
CONF-9307123–		(U.S./Japan seminar on physics and chemistry of C_{60} and related compounds; Honolulu, HI (United States); 10-23 Jul 1993)			
1	19:1108	*See* ANL/CHM/CP–80106			
CONF-9307124–		(17. international conference on defects in semiconductors; Gmunden (Austria); 18-23 Jul 1993)			
2	19:1126	*See* LBL–34278			
CONF-9307125–		(2. ^{3}He and fusion power symposium; Madison, WI (United States); 18-22 Jul 1993)			
2	19:2731	*See* ANL/EP/CP–79939			
CONF-9307126–		(9. international conference on mathematical and computer modeling; Oxford (United Kingdom); 26-29 Jul 1993)			
1	19:1386	*See* PNL-SA–22414			
CONF-930713–		(10. detonation symposium; Boston, MA (United States); 12-16 Jul 1993)			
25	19:1849	*See* UCRL-JC–111337			
27	19:1856	*See* UCRL-JC–114109			
28	19:1845	*See* LA-UR–93-2904			
30	19:1850	*See* UCRL-JC–111342			
32	19:1851	*See* UCRL-JC–111343			

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CONF-9307132–		(Technical steering panel meeting; Post Falls, ID (United States); 15-17 Jul 1993)			
1	19:2187	*See* BN-SA–3799-HEDR			
CONF-9307136–		(5. international congress on condition monitoring and diagnostic engineering management; Bristol (United Kingdom); 21-23 Jul 1993)			
1	19:1372	*See* ANL/RE/CP–80234			
CONF-9307138–		(LAMDAMAP 93: laser methodology and machine performance; Southhampton (United Kingdom); 13-15 Jul 1993)			
1	19:1399	*See* UCRL-JC–114562			
CONF-9307139–		(12. record of alloy semiconductor physics and electronics symposium; Izunagaoka (Japan); 14-16 Jul 1993)			
1	19:1128	*See* LBL–34395			
CONF-9307140–		(Contamination free manufacturing focus technical advisory board meeting; Austin, TX (United States); 14-15 Jul 1993)			
1	19:1451	*See* SAND–93-1750C			
CONF-9307142–		(3. IUMRS international conference; Tokyo (Japan); 31 Jul - 4 aug 1993)			
1	19:1011	*See* IS-M–761			
CONF-9307143–		(5. international symposium on heavy flavor physics; Montreal (Canada); 6-10 Jul 1993)			
2	19:2388	*See* FNAL/C–93/271-E			
CONF-9307145–		(Workshop on electron nucleus scattering; Elba (Italy); 5-10 Jul 1993)			
1	19:2373	*See* ANL/PHY/CP–80703			
2	19:2457	*See* ANL/PHY/CP–81005			
CONF-9307148–		(N reactor lessons learned workshop; Richland, WA (United States); 20-22 Jul 1993)			
1	19:772	*See* PNL-SA–22755			
CONF-930717–		(ICPEAC: satellite meeting on electron collision with molecules, clusters and surfaces; London (United Kingdom); 29-30 Jul 1993)			
1	19:2556	*See* UCRL-JC–114340			
CONF-930719–		(Conference on the bubble chamber and its role in particle physics; Geneva (Switzerland); 14-16 Jul 1993)			
1	19:1601	*See* ANL-HEP-CP–93-79			
2	19:2557	*See* ANL-HEP-CP–93-76			
CONF-930720–		(20. European conference on controlled fusion and plasma physics; Lisbon (Portugal); 26-30 Jul 1993)			
20	19:2623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000375	MF-421
CONF-930722–		(Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE); San Diego, CA (United States); 11-16 Jul 1993)			
23	19:1804	*See* UCRL-JC–113475			
31	19:2545	*See* UCRL-JC–112554			
32	19:1457	*See* UCRL-JC–112553			
33	19:1514	*See* ANL/XFD/CP–78645			
34	19:1461	*See* UCRL-JC–114493			
37	19:2791	*See* UCRL-JC–113091			
38	19:2726	*See* UCRL-JC–114803			
39	19:1599	*See* SLAC-PUB–6259			
40	19:1570	*See* SLAC-PUB–6268			
41	19:1572	*See* SLAC-PUB–6306			
42	19:1573	*See* SLAC-PUB–6307			
43	19:1600	*See* EGG-M–93041			
44	19:1496	*See* LBL–33355			
45	19:1594	*See* LBL–33237			
46	19:1946	*See* LA-UR–93-3437			
47	19:1595	*See* LBL–33341			
48	19:1545	*See* LA-UR–93-3529			
49	19:1447	*See* SAND–93-0337C			
50	19:1876	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002439	
CONF-930746–		(Annual meeting of the Health Physics Society (HPS); Atlanta, GA (United States); 11-15 Jul 1993)			
3	19:391	*See* ANL/EA/CP–78779			

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CONF-930749–		(34. annual meeting of the Institute of Nuclear Materials Management; Scottsdale, AZ (United States); 18-21 Jul 1993)			
29	19:279	*See* LA-UR–93-2579			
57	19:477	*See* LA-UR–93-2609			
73	19:474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000332	MF-406
77	19:484	*See* UCRL-JC–112769			
78	19:486	*See* Y/MA–37-7212			
79-Rev.1	19:846	*See* WHC-SA–1797-Rev.1			
CONF-930759–		(NATO advanced study workshop on metallic alloys: experimental and theoretical perspectives; Boca Raton, FL (United States); 16-21 Jul 1993)			
2	19:1064	*See* UCRL-JC–114779			
CONF-930761–		(International Europhysics conference on high-energy physics; Marseille (France); 22-28 Jul 1993)			
1	19:2440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040024	MF-414
CONF-930785–		(8. international conference on numerical methods in laminar and turbulent flow; Swansea (United Kingdom); 18-23 Jul 1993)			
3	19:1427	*See* UCRL-JC–112596			
CONF-930796–		(1993 Chinese American Academic and Professional convention; Chicago, IL (United States); 2-5 Jul 1993)			
4	19:1819	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000376	MF-406
5	19:1903	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000492	MF-902
CONF-930801–		(Conference of the International Union of Pure and Applied Physics on low temperature physics (LT 20); Eugene, OR (United States); 1-11 Aug 1993)			
12	19:1073	*See* ANL/MSD/CP–80634			
CONF-930802–		(206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993)			
11	19:878	*See* ANL/CMT/CP–79775			
14	19:1164	*See* DOE/METC/C–93/7102			
16	19:1221	*See* SAND–93-2265C			
CONF-930803–		(12. biennial conference for the International Association for Structural Mechanics in Reactor Technology (SMIRT 12); Stuttgart (Germany); 16-26 Aug 1993)			
	19:692	*See* CEA-CONF–11464			
CONF-930804–		(28. intersociety energy conversion engineering conference; Atlanta, GA (United States); 8-13 Aug 1993)			
18	19:653	*See* DOE/METC/C–93/7097			
20	19:876	*See* IS-M–767			
CONF-930807–		(16. reactor operations international topical meeting; Long Island, NY (United States); 15-18 Aug 1993)			
7	19:776	*See* BNL-NUREG–49116			
CONF-930809–		(8. ASTM-EURATOM symposium on reactor dosimetry; Vail, CO (United States); 29 Aug - 3 sep 1993)			
3	19:1798	*See* SAND–92-2532C			
5	19:2516	*See* SAND–92-2551C			
6	19:1809	*See* SAND–92-2482C			
8	19:2768	*See* LA-UR–93-3452			
10	19:996	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001123	
CONF-930810–		(Topical meeting on environmental transport and dosimetry; Charleston, SC (United States); 31 Aug - 3 sep 1993)			
7	19:1893	*See* ANL/EAIS/CP–78684			
8	19:1895	*See* ANL/ER/CP–79760			
9	19:1971	*See* UCRL-JC–114028			
CONF-9308122–		(International Union of Materials Research Societies on advanced materials; Tokyo (Japan); 31 Aug - 4 sep 1993)			
4	19:490	*See* ANL/MSD/CP–78737			
6	19:1116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000335	MF-404

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8	19:1080	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000330	MF-332
9	19:1081	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000374	MF-404
10	19:985	*See* ANL/MSD/CP–80905			
CONF-9308136–		(5. international conference on ion sources; Peking (China); 31 Aug - 4 sep 1993)			
2	19:1512	*See* ANL/PHY/CP–80620			
5	19:507	*See* LA-UR–93-2990			
6	19:1577	*See* SSCL-Preprint–499			
CONF-9308137–		(1993 summer national American Institute of Chemical Engineers (AIChE) conference; Seattle, WA (United States); 15-18 Aug 1993)			
5	19:351	*See* WHC-SA–1811			
7	19:310	*See* PNL-SA–22748			
CONF-9308138–		(11. international invitational symposium on the unification of analytical, computational, and experimental solution methodologies; Danvers, MA (United States); 18-20 Aug 1993)			
3	19:2157	*See* LA-UR–93-2901			
CONF-9308143–		(1993 Society of Automotive Engineers (SAE) future transportation technology conference; San Antonio, TX (United States); 9-12 Aug 1993)			
2	19:916	*See* ANL/ES/CP–78817			
CONF-9308145–		(6. Strategic Defense Initiative Organization/Office of Naval Research (SDIO/ONR) pulse power meeting; Chicago, IL (United States); 9-11 Aug 1993)			
1	19:976	*See* UCRL-JC–114927			
CONF-9308149–		(4. international symposium on high pressure low temperature plasma chemistry; Bratislava (Slovakia); 29 Aug - 1 sep 1993)			
1	19:975	*See* UCRL-JC–114852			
CONF-9308150–		(Environmentally conscious manufacturing congress '93; Arlington, VA (United States); 30 Aug - 1 sep 1993)			
2	19:1865	*See* LA-UR–93-3103			
5	19:243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000338	MF-904
8	19:1258	*See* Y/DV–1268			
10	19:1145	*See* Y/DV–1276			
11	19:1408	*See* Y/DV–1273			
CONF-9308151–		(North Atlantic Treaty Organization (NATO) advanced research workshop; Toulouse (France); 30 Aug - 3 sep 1993)			
1	19:1453	*See* SAND–93-1981C			
CONF-9308152–		(ICRP-60: International Atomic Energy Agency interregional training course on management of radioactive waste from nuclear power plants; Argonne, IL (United States); 23 Aug - 17 sep 1993)			
1	19:2183	*See* ANL/CMT/CP–80617			
2	19:2182	*See* ANL/CMT/CP–80616			
CONF-9308154–		(4. international conference on the structure of surfaces; Shanghai (China); 16-19 Aug 1993)			
1	19:1092	*See* LA-UR–93-2821			
CONF-9308156–		(Workshop on plasma-based ion implantation; Madison, WI (United States); 4-6 Aug 1993)			
1	19:2302	*See* LA-UR–93-2950			
2	19:1024	*See* LA-UR–93-3216			
CONF-9308158–		(International symposium on advances in sol-gel processing and applications; Chicago, IL (United States); 27-28 Aug 1993)			
2	19:1107	*See* UCRL-JC–113378			
3	19:1143	*See* UCRL-JC–114192			
CONF-9308159–		(SOAR 93: space operations, applications, and research conference; Houston, TX (United States); 3-5 Aug 1993)			
1	19:1393	*See* SAND–93-1835C			
2	19:1390	*See* SAND–93-1420C			
3	19:2079	*See* PNL-SA–22765			

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CONF-930816–		(International conference on the applications of the Moessbauer effect; Vancouver (Canada); 8-14 Aug 1993)			
3	19:2572	*See* ANL/XFD/CP–79184			
CONF-9308161–		(IMPACT-4: structural mechanics in reactor technology conference; Berlin (Germany); 23-24 Aug 1993)			
1	19:2875	*See* SAND–93-1806C			
CONF-9308162–		(2. workshop on high density plasmas and their applications; San Francisco, CA (United States); 5-6 Aug 1993)			
1	19:1136	*See* SAND–93-1856C			
CONF-9308163–		(North Atlantic Treaty Organization (NATO) advanced research workshop on corrosion of advanced ceramics; Tubingen (Germany); 30 Aug - 3 sep 1993)			
1	19:1094	*See* LA-UR–93-2942			
2	19:1097	*See* LA-UR–93-3189			
CONF-9308164–		(14. European conference on few-body problems in physics; Amsterdam (Netherlands); 22-27 Aug 1993)			
1	19:2397	*See* LA-UR–93-3006			
3	19:2435	*See* LA-UR–93-3377			
4	19:2436	*See* LA-UR–93-3378			
CONF-9308165–		(BIOMAG 93: international conference on biomagnetism; Vienna (Austria); 16-20 Aug 1993)			
1	19:2176	*See* LA-UR–93-2986			
CONF-9308166–		(2. international summer school on physics in radiotherapy; Warsaw (Poland); 26 Aug - 3 sep 1993)			
1	19:2158	*See* LA-UR–93-2983			
CONF-9308167–		(20. annual review of progress in quantitative nondestructive evaluation (NDE); Brunswick, ME (United States); 1-6 Aug 1993)			
1	19:2303	*See* ANL/ET/CP–79670			
2	19:1070	*See* ANL/ET/CP–79613			
CONF-9308168–		(International seminar on planetary emergencies; Erice (Italy); 19-24 Aug 1993)			
1	19:2773	*See* LBL–34415			
2	19:1462	*See* UCRL-JC–115147			
CONF-9308171–		(8. Institute of Electrical and Electronics Engineers (IEEE) international symposium on intelligent control; Chicago, IL (United States); 25-27 Aug 1993)			
1	19:1391	*See* SAND–93-1468C			
CONF-9308172–		(5. international symposium on computational fluid dynamics; Sendai (Japan); 31 Aug - 3 sep 1993)			
1	19:2324	*See* UCRL-JC–114363			
CONF-9308173–		(International conference on strongly correlated electronic systems; San Diego, CA (United States); 15-19 Aug 1993)			
1	19:1102	*See* SAND–93-1979C			
2	19:1096	*See* LA-UR–93-3144			
3	19:1022	*See* LA-UR–93-3143			
CONF-9308175–		(Latin American workshop on magnetism; Guanujuato (Mexico); 23-28 Aug 1993)			
1	19:995	*See* ANL/MSD/CP–80646			
CONF-9308176–		(15. boundary element methods (BEM) conference; Worcester, MA (United States); 10-12 Aug 1993)			
1	19:2839	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000340	MF-405
CONF-9308177–		(Environmental remediation conference; Augusta, GA (United States); 25-28 Aug 1993)			
1	19:439	*See* RFP–4775			
CONF-9308180–		(9. annual model conference on waste management and environmental restoration; Oak Ridge, TN (United States); 23-26 Aug 1993)			
2	19:849	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000902	MF-900

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CONF-9308181–		(Pre-equilibrium Parton dynamics; Berkeley, CA (United States); 23 Aug - 3 sep 1993)			
1	19:2367	*See* LA-UR–93-3227			
CONF-9308183–		(Workshop on local transport studies in fusion plasmas; Varenna (Italy); 30 Aug - 3 sep 1993)			
1	19:2650	*See* GA-A–21413			
CONF-9308184–		(International Association of Public Participation Practitioners conference; Richland, WA (United States); 30 Aug - 3 sep 1993)			
1	19:840	*See* PNL-SA–22959			
CONF-930823–		(Symposium on lepton and photon interactions; Ithaca, NY (United States); 10-15 Aug 1993)			
12	19:2407	*See* FNAL/C–93/203-E			
13	19:2334	*See* FNAL/C–93/213-E			
14	19:2408	*See* FNAL/C–93/212-E			
CONF-930824–		(Synchrotron radiation instrumentation; Gaithersburg, MD (United States); 23-26 Aug 1993)			
4	19:1515	*See* ANL/XFD/CP–79799			
6	19:1509	*See* ANL/ECT/CP–80138			
7	19:1550	*See* LBL–34547			
9	19:1520	*See* ANL/XFD/CP–80408			
10	19:1519	*See* ANL/XFD/CP–80255			
11	19:1586	*See* ANL/XFD/CP–80252			
12	19:1585	*See* ANL/XFD/CP–80084			
13	19:1517	*See* ANL/XFD/CP–80251			
14	19:1516	*See* ANL/XFD/CP–80250			
15	19:1607	*See* ANL/PHY/CP–80890			
16	19:1587	*See* ANL/XFD/CP–80843			
17	19:1518	*See* ANL/XFD/CP–80254			
19	19:1584	*See* ANL/OTD-APS/CP–80851			
CONF-930825–		(6. international symposium on environmental degradation of materials in nuclear power systems: water reactors; San Diego, CA (United States); 3-5 Aug 1993)			
5	19:1016	*See* KAPL–4759			
7	19:1065	*See* WAPD-T–2991			
9	19:989	*See* ANL/ET/CP–80756			
CONF-930830–		(National conference and exposition on heat transfer; Atlanta, GA (United States); 8-11 Aug 1993)			
11-Rev.1	19:1139	*See* UCRL-JC–111969-Rev.1			
30	19:711	*See* WAPD-T–2967			
CONF-930835–		(EPRI/EPA/DOE sulfur dioxide control symposium; Boston, MA (United States); 24-27 Aug 1993)			
1	19:868	*See* ANL/DIS/CP–81110			
CONF-930838–		(International Solar Energy Society world congress; Budapest (Hungary); 23-27 Aug 1993)			
1	19:560	*See* NREL/TP–413-5752			
CONF-930843–		(International conference on environmental radioactivity in the arctic and antarctic; Kirkenes (Norway); 23-27 Aug 1993)			
1	19:805	*See* UCRL-JC–114680-VGS			
CONF-930852–		(8. international meeting on ferroelectricity; Gaithersburg, MD (United States); 8-13 Aug 1993)			
3	19:1111	*See* ANL/MSD/CP–78506			
CONF-930855–		(15. international free electron laser conference; The Hague (Netherlands); 23-27 Aug 1993)			
6	19:1507	*See* ANL/ASD/CP–79651			
7	19:1445	*See* LBL–34015			
8	19:1945	*See* LA-UR–93-3419			
CONF-930863–		(International superconductive electronic conference; Boulder, CO (United States); 11-14 Aug 1993)			
1	19:2585	*See* UCRL-JC–114285			

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CONF-930865–		(International conference on strongly correlated electron systems; La Jolla, CA (United States); 16-19 Aug 1993)			
2	19:1020	*See* LA-UR–93-2919			
3	19:2532	*See* LA-UR–93-2888			
4	19:2512	*See* LA-UR–93-2949			
7	19:1093	*See* LA-UR–93-2879			
11	19:2609	*See* LA-UR–93-3329			
CONF-930867–		(Gull Lake nuclear physics conference on giant resonances; Gull Lake, MI (United States); 17-21 Aug 1993)			
1	19:2434	*See* LA-UR–93-2928			
CONF-930873–		(2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993)			
30	19:369	*See* WINCO–11939			
CONF-930893–		(Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat; Morgantown, WV (United States); 3-5 Aug 1993)			
4	19:884	*See* DOE/NBM–94000017			
6	19:882	*See* DOE/MC/27394–94/C0263			
12	19:883	*See* DOE/MC/28065–94/C0249			
14	19:881	*See* DOE/ER/81186–94/C0265			
CONF-930904–		(7. international coal science conference; Banff (Canada); 12-17 Sep 1993)			
11	19:29	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000477	MF-401
CONF-930905–		(Actinides '93; Santa Fe, NM (United States); 19-24 Sep 1993)			
3	19:1025	*See* LA-UR–93-3249			
4	19:235	*See* ANL/CMT/CP–79275			
6	19:1028	*See* LA-UR–93-3449			
7	19:2437	*See* LA-UR–93-3490			
8	19:1301	*See* LA-UR–93-3464			
10	19:1026	*See* LA-UR–93-3304			
11	19:1027	*See* LA-UR–93-3350			
13	19:1147	*See* ANL/CHM/CP–79025			
14	19:1280	*See* ANL/CHM/CP–79022			
15	19:284	*See* LA-UR–93-3404			
16	19:1254	*See* LA-UR–93-3333			
CONF-930906–		('93 international conference on nuclear waste management and environmental remediation; Prague (Czech Republic); 5-11 Sep 1993)			
13	19:309	*See* PNL-SA–22596			
CONF-930907–		(ANS topical meeting on physics and methods in criticality safety; Nashville, TN (United States); 19-23 Sep 1993)			
11	19:1403	*See* WHC-SA–1714			
12	19:1286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041050	MF-413
13	19:1375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000473	
CONF-9309103–		(7. symposium on containment of underground nuclear explosions; Kent, WA (United States); 13-17 Sep 1993)			
2	19:1463	*See* SAND–93-0513C			
CONF-9309111–		(10. annual international Pittsburgh coal conference: coal - energy and the environment; Pittsburgh, PA (United States); 20-24 Sep 1993)			
4	19:57	*See* DOE/METC/C–93/7099			
CONF-930913–		(Global '93: future nuclear systems - emerging fuel cycles and waste disposal options; Seattle, WA (United States); 12-17 Sep 1993)			
33	19:207	*See* ANL/CMT/CP–78029			
34	19:980	*See* ANL/OTD-ER/CP–79937			
35	19:282	*See* LA-UR–93-2944			
40	19:234	*See* ANL/CMT/CP–78477			
43	19:223	*See* WHC-SA–1821			
44	19:713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000479	MF-521
45	19:283	*See* LA-UR–93-3291			

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CONF-9309137–		(International specialty conference on control of ozone depleting substances: delivering the Montreal protocol; Whistler (Canada); 22-24 Sep 1993)			
1	19:841	*See* PNL-SA–23021			
CONF-9309138–		(Intakes of radionuclide detection, assessment and limitation of occupational exposure; Bath (United Kingdom); 13-17 Sep 1993)			
1	19:2226	*See* LBL–34569			
CONF-9309139–		(20. American Society for Quality Control (ASQC) national energy and environmental annual conference; Indian Wells, CA (United States); 19-22 Sep 1993)			
9	19:847	*See* WINCO–11968			
CONF-9309142–		(20. rare earth research conference; Monterey, CA (United States); 12-17 Sep 1993)			
3	19:1071	*See* ANL/IPNS/CP–79265			
4	19:1068	*See* ANL/CHM/CP–79242			
CONF-9309146–		(5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management; Atlanta, GA (United States); 27-29 Sep 1993)			
2	19:1257	*See* WSRC-MS–93-169			
3	19:1972	*See* ANL/CMT/CP–79321			
5	19:1889	*See* LA-UR–93-3406			
6	19:2081	*See* SAND–93-7077C			
CONF-9309156–		(8. international conference on finite elements in fluids: new trends and applications; Barcelona (Spain); 20-24 Sep 1993)			
2	19:2084	*See* UCRL-JC–114175			
CONF-930916–		(GLOBAL '93: topical meeting on global implications of advanced nuclear fuel cycle and disposal choices; Richland, WA (United States); 12-16 Sep 1993)			
1	19:374	*See* WSRC-MS–93-475			
CONF-9309185–		(Fluctuations and order: the new synthesis workshop; Los Alamos, NM (United States); 9-12 Sep 1993)			
2	19:2608	*See* LA-UR–93-3241			
3	19:2347	*See* LA-UR–93-3496			
CONF-9309191–		(International radon conference; Denver, CO (United States); 20-23 Sep 1993)			
1	19:2074	*See* LBL–34461			
CONF-9309199–		(Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation; Boston, MA (United States); 7-10 Sep 1993)			
5	19:1812	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000331	MF-406
6	19:177	*See* UCRL-JC–114864			
9	19:1400	*See* UCRL-JC–115169			
10	19:2085	*See* UCRL-JC–115005			
CONF-9309204–		(3. international workshop on accelerator alignments; Annecy (France); 28 Sep - 1 oct 1993)			
1	19:1806	*See* UCRL-JC–114445			
3	19:1470	*See* ANL/ASD/CP–80266			
CONF-9309215–		(Surety technology symposium; Chelyacinsk (Russian Federation); 28 Sep - 2 oct 1993)			
2	19:2245	*See* LA-UR–93-3306			
3	19:445	*See* SAND–93-2215C			
4	19:1437	*See* SAND–93-2213C			
6	19:444	*See* SAND–93-2214C			
CONF-9309216–		(Reverse field pinch (RFP) planning meeting; Padova (Italy); 20-24 Sep 1993)			
1	19:2765	*See* LA-UR–93-2870			
CONF-9309217–		(4. international conference on batteries for energy storage; Berlin (Germany); 29 Sep - 1 oct 1993)			
1	19:814	*See* SAND–93-0160C			

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2	19:817	*See* SAND–93-1817C			
3	19:816	*See* SAND–93-1770C			
4	19:818	*See* SAND–93-1849C			
CONF-9309218–		(11. ozone world congress; San Francisco, CA (United States); 1 Sep 1993)			
2	19:1970	*See* UCRL-JC–113194			
CONF-9309219–		(American Institute of Aeronautics and Astronautics (AIAA) space programs and technologies conference and exhibit; Huntsville, AL (United States); 21-23 Sep 1993)			
1	19:1392	*See* SAND–93-1784C			
CONF-9309224–		(Ballistics 93: 14. international symposium on ballistics; Quebec (Canada); 26-29 Sep 1993)			
1	19:1839	*See* UCRL-JC–112683			
2	19:1055	*See* UCRL-JC–112763			
CONF-9309225–		(American Institute of Aeronautics and Astronautics conference on small satellites; Logan, UT (United States); 13-16 Sep 1993)			
1	19:819	*See* UCRL-JC–114996			
CONF-9309227–		(Nonlinear numerical methods and rational approximation; Antwerp (Belgium); 6-10 Sep 1993)			
1	19:2861	*See* LA-UR–93-3072			
CONF-9309228–		(Focus 93: site characterization and model validation; Las Vegas, NV (United States); 26-29 Sep 1993)			
1	19:319	*See* SAND–93-1109C			
CONF-9309230–		(2. international workshop in integrating geographic information systems and environmental modeling; Breckenridge, CO (United States); 27-29 Sep 1993)			
2	19:2250	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001121	MF-402
CONF-9309231–		(International conference on textures of materials; Clausthal (Germany); 20-24 Sep 1993)			
1	19:1021	*See* LA-UR–93-3115			
2	19:1218	*See* LA-UR–93-3268			
3	19:1029	*See* LA-UR–93-3453			
4	19:1030	*See* LA-UR–93-3454			
5	19:1032	*See* LA-UR–93-3504			
CONF-9309232–		(Clay Minerals Society meeting on computer applications in clay mineralogy; San Diego, CA (United States); 25 Sep 1993)			
1	19:1217	*See* LA-UR–93-2660			
CONF-9309234–		(Military application of blast simulation; The Hague (Netherlands); 13-17 Sep 1993)			
1	19:1848	*See* UCRL-JC–107192			
2	19:1852	*See* UCRL-JC–111897			
3	19:1858	*See* UCRL-JC–114577			
CONF-9309236–		(JOWOG 28 meeting; Los Alamos, NM (United States); 27-30 Sep 1993)			
Absts.	19:1125	*See* LA–12673-C			
CONF-9309237–		(International Atomic Energy Agency (IAEA) specialist meeting on irradiation embrittlement and optimization of annealing; Paris (France); 20-23 Sep 1993)			
1	19:740	*See* SAND–93-1745C			
CONF-9309238–		(1993 conference on natural language information analysis methodology and information system design methodology; Utrecht (Netherlands); 15-17 Sep 1993)			
1	19:2888	*See* SAND–93-2130C			
CONF-9309239–		(Computational and machine learning workshop; Provincetown, MA (United States); 10-12 Sep 1993)			
1	19:2840	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041047	MF-405
CONF-9309240–		(1. Vsystem (vax) workshop and user's group meeting; Upton, NY (United States); 8-10 Sep 1993)			
1	19:1511	*See* ANL/PHY/CP–80460			

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CONF-9309242–		(5. international symposium on creep and shrinkage of concrete; Barcelona (Spain); 6-9 Sep 1993)			
1	19:1117	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040836	MF-404
CONF-9309244–		(13. Fermilab industrial affiliates meeting and industry briefing; Chicago, IL (United States); 9 Sep 1993)			
1	19:2330	*See* LA-UR–93-3271			
CONF-9309246–		(1993 international oracle users' meeting; Orlando, FL (United States); 26 Sep - 1 oct 1993)			
1	19:2885	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000494	MF-405
CONF-9309247–		(National Institute of Standards and Technology (NIST) workshop on gas sensors; Gaithersburg, MD (United States); 8-9 Sep 1993)			
1	19:1828	*See* SAND–93-1954C			
2	19:2080	*See* PNL-SA–23102			
3	19:2070	*See* IS-M–774			
CONF-9309251–		(8. international conference on surface modification of metals by ion beams; Kanazawa (Japan); 13-17 Sep 1993)			
1	19:994	*See* ANL/MSD/CP–79942			
CONF-9309253–		(12. meeting on physics of nuclear fissions; Obninsk (Russian Federation); 27-30 Sep 1993)			
1	19:2513	*See* LA-UR–93-3236			
CONF-9309254–		(5. international symposium on environmental concerns in rights-of-way (ROW) management; Montreal (Canada); 19-22 Sep 1993)			
1	19:156	*See* ANL/ES/CP–79268			
CONF-9309258–		(3. international workshop on accelerator alignment; Geneva (Switzerland); 28 Sep - 3 oct 1993)			
1	19:1488	*See* SSCL-Preprint–505			
CONF-930926–		(13. international conference on magnet technology; Victoria (Canada); 20-24 Sep 1993)			
2	19:2311	*See* LA-UR–93-3390			
3	19:1542	*See* LA-UR–93-3254			
4	19:1383	*See* LA-UR–93-3466			
5	19:1444	*See* LA-UR–93-3237			
6	19:1381	*See* LA-UR–93-3389			
7	19:1580	*See* ANL/ASD/CP–78734			
8	19:1582	*See* ANL/ASD/CP–78736			
9	19:1543	*See* LA-UR–93-3320			
10	19:1581	*See* ANL/ASD/CP–78735			
13	19:986	*See* LA-UR–93-3391			
14	19:1544	*See* LA-UR–93-3321			
15	19:2796	*See* UCRL-JC–114679			
16	19:1523	*See* BNL–49551			
17	19:2790	*See* UCRL-JC–112765			
18	19:1497	*See* LBL–33432			
19	19:1508	*See* ANL/ASD/CP–80971			
20	19:1385	*See* LA-UR–93-3715			
CONF-9309261–		(2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus; Ibaraki (Japan); 15-17 Sep 1993)			
1	19:2732	*See* ANL/EP/CP–80924			
CONF-9309262–		(1993 symposium of North-Eastern Accelerator Personnel (SNEAP); Rochester, NY (United States); 22-25 Sep 1993)			
1	19:1464	*See* ANL/PHY/CP–80830			
CONF-9309264–		(Society of Photo-Optical Instrumentation Engineers (SPIE) symposium on microelectronics procession; Monterey, CA (United States); 27-29 Sep 1993)			
1	19:1459	*See* UCRL-JC–114003			
CONF-9309266–		(18. international conference on infrared and millimeter waves; Essex (United Kingdom); 6-10 Sep 1993)			
2	19:2641	*See* ETDE-IT–93-220			

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CONF-9309273–		(3. London conference on positron sensitive detectors; London (United Kingdom); 6-10 Sep 1993)			
1	19:1609	*See* ANL/XFD/CP–80859			
CONF-930928–		(6. international conference on fusion reactor materials; Stresa (Italy); 27 Sep - 1 oct 1993)			
3	19:2728	*See* ANL/EP/CP–79740			
4	19:2766	*See* LA-UR–93-2951			
5	19:1113	*See* ANL/MSD/CP–79440			
6	19:987	*See* ANL/EP/CP–79739			
8	19:2733	*See* ANL/ET/CP–80889			
9	19:990	*See* ANL/ET/CP–80862			
CONF-930932–		(International symposium on subsurface microbiology; Bath (United Kingdom); 19-24 Sep 1993)			
1	19:2094	*See* WSRC-MS–93-039			
CONF-930948–		(23. international electric propulsion conference; Seattle, WA (United States); 13-16 Sep 1993)			
1	19:971	*See* UCRL-JC–114643			
CONF-930960–		(6. international conference on accelerator mass spectrometry; Canberra (Australia); 17 Sep - 1 oct 1993)			
1	19:1223	*See* UCRL-JC–114139			
CONF-930997–		(International symposium on structural intermetallics; Champion, PA (United States); 26-30 Sep 1993)			
5	19:997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040600	MF-404
5	19:998	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000493	MF-404
CONF-931002–		(Geological Society of America annual meeting; Boston, MA (United States); 25-28 Oct 1993)			
1	19:388	*See* WHC-SA–1792			
CONF-931005–		(6. international topical meeting on nuclear reactor thermal hydraulics; Grenoble (France); 5-8 Oct 1993)			
1	19:225	*See* ANL/FC/CP–78840			
CONF-931006–		(Joint power generation conference; Kansas City, MO (United States); 17-21 Oct 1993)			
1	19:54	*See* DOE/MC/27364–93/C0227			
2	19:715	*See* ANL/FC/CP–80288			
CONF-931009–		(Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials in conjunction with materials week and the Materials Applications and Services Exposition; Pittsburgh, PA (United States); 17-21 Oct 1993)			
2	19:1019	*See* LA-UR–93-2686			
3	19:1088	*See* IS-M–753			
4	19:1124	*See* IS-M–768			
5	19:1433	*See* IS-M–772			
8	19:1109	*See* ANL/ET/CP–78614			
12	19:988	*See* ANL/ET/CP–79400			
CONF-9310100–		(Human Factors and Ergonomics Society meeting; Seattle, WA (United States); 11-15 Oct 1993)			
3	19:2841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000480	MF-506
CONF-9310102–		(4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993)			
3	19:1387	*See* RFP–4727			
7	19:1405	*See* WSRC-MS–93-441			
12	19:352	*See* WHC-SA–1881			
13	19:826	*See* LA-UR–93-3008			
14	19:757	*See* LA-UR–93-3007			
16	19:2277	*See* UCRL-JC–115113			
17	19:2251	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040604	MF-403
18	19:778	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040602	MF-600
19	19:241	*See* ANL/RE/CP–80533			
20	19:806	*See* WSRC-MS–93-469			
21	19:1376	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000339	MF-903
22	19:438	*See* RFP–4726			
23	19:716	*See* ANL/FE/CP–78906			

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25	19:372	*See* WSRC-MS--93-442			
26	19:355	*See* WHC-SA--2025			
27	19:395	*See* ANL/FE/CP--79340			
28	19:470	*See* WSRC-MS--93-454			
31	19:1401	*See* UCRL-JC--115232			
32	19:761	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002436	MF-523
33	19:231	*See* WHC-SA--2087			
CONF-9310111--		(Conference and open forum for the presentation of significant results: achievements of the OECD Three Mile Island vessel investigation project; Boston, MA (United States); 20-22 Oct 1993)			
1	19:690	*See* ANL/ET/CP--79638			
CONF-9310131--		(29. annual international telemetering conference; Las Vegas, NV (United States); 25-28 Oct 1993)			
3	19:1883	*See* UCRL-JC--112639			
4	19:1397	*See* UCRL-JC--112638			
5	19:1882	*See* UCRL-JC--112637			
6	19:1881	*See* UCRL-JC--112636			
CONF-9310135--		(32. Hanford symposium on health and the environment; Richland, WA (United States); 18-21 Oct 1993)			
1	19:322	*See* SAND--93-2266C			
CONF-931014--		(5. international conference on processing and utilization of high sulfur coals; Lexington, KY (United States); 24-28 Oct 1993)			
1	19:6	*See* ANL/CHM/CP--79226			
2	19:26	*See* IS-M--764			
CONF-9310145--		(INFOTECH '93; Oak Ridge, TN (United States); 20-23 Oct 1993)			
1	19:2887	*See* SAND--93-1446C			
2	19:825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002190	MF-402
CONF-9310146--		(Sensors Expo conference; Philadelphia, PA (United States); 26-28 Oct 1993)			
1	19:1827	*See* SAND--93-1564C			
CONF-9310153--		(Parallel rendering symposium; San Jose, CA (United States); 25 Oct 1993)			
1	19:2862	*See* LA-UR--93-3138			
CONF-9310155--		(Mountain Plains management conference; Cedar, UT (United States); 7-9 Oct 1993)			
1	19:2816	*See* SAND--93-1945C			
CONF-9310158--		(Zinc '93; Hobart (Australia); 10-13 Oct 1993)			
1	19:925	*See* ANL/ES/CP--80360			
CONF-9310159--		(OCEANS 93: engineering in harmony with the ocean; Victoria (Canada); 18-21 Oct 1993)			
1	19:2325	*See* UCRL-JC--114934			
CONF-9310160--		(Advanced ground penetrating radar: technologies and applications; Columbus, OH (United States); 26-28 Oct 1993)			
1	19:457	*See* WHC-SA--2018			
CONF-9310161--		(2. international Austrian conference on parallel computing (ACPC); Vienna (Austria); 4-8 Oct 1993)			
1	19:2321	*See* UCRL-JC--113895			
CONF-9310163--		(Environmental restoration and decontamination and decommissioning activities and energy facility contractors workshop; Albuquerque, NM (United States); 5-6 Oct 1993)			
1	19:456	*See* WHC-SA--1997			
CONF-9310164--		(International symposium on substance identification technologies; Innsbruck (Austria); 4-8 Oct 1993)			
1	19:1853	*See* UCRL-JC--113252			
3	19:2584	*See* UCRL-JC--113254			
5	19:1477	*See* LA-UR--93-3469			
CONF-9310167--		(64. shock and vibration symposium; Ft. Walton Beach, FL (United States); 25-28 Oct 1993)			
3	19:919	*See* ANL/ET/CP--80666			

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CONF-9310168–		(Solution Mining Research Institute annual meeting; Lafayette, LA (United States); 24-28 Oct 1993)			
1	19:69	*See* SAND–93-2012C			
CONF-9310169–		(1993 automotive technology development contractors' meeting; Dearborn, MI (United States); 18-21 Oct 1993)			
1	19:879	*See* ANL/CMT/CP–80587			
CONF-9310170–		(American Society of Mechanical Engineers/Society of Tribologists and Lubrication Engineers (ASME/STLE) joint tribology cconference; New Orleans, LA (United States); 24-27 Oct 1993)			
1	19:1072	*See* ANL/MCT/CP–79124			
CONF-9310172–		(International logic programming symposium; Vancouver (Canada); 26-29 Oct 1993)			
1	19:2136	*See* ANL/MCS/CP–80305			
CONF-9310173–		(5. international energy conference; Seoul (Korea, Republic of); 18-22 Oct 1993)			
1	19:1898	*See* ANL/ER/CP–80457			
2	19:1897	*See* ANL/ER/CP–80454			
CONF-9310174–		(UNITECR 93; Sao Paulo (Brazil); 31 Oct - 3 nov 1993)			
1	19:991	*See* ANL/MCT/CP–77517			
CONF-9310176–		(6. international LAPP meeting; Boston, MA (United States); 25-28 Oct 1993)			
1	19:2715	*See* PPPL-CFP–2959			
CONF-9310179–		(CONEC '93: conference on environmental commerce; Chattanooga, TN (United States); 17-20 Oct 1993)			
1	19:390	*See* ANL/CMT/CP–80310			
CONF-931018–		(Symposium on fusion engineering; Hyannis, MA (United States); 11-15 Oct 1993)			
1	19:2716	*See* PPPL-CFP–2961			
2	19:2753	*See* GA-A–21440			
3	19:2749	*See* GA-A–21428			
8	19:2746	*See* GA-A–21414			
9	19:2744	*See* GA-A–21403			
10	19:2752	*See* GA-A–21439			
11	19:2747	*See* GA-A–21416			
12	19:2748	*See* GA-A–21417			
13	19:2742	*See* GA-A–21381			
14	19:2778	*See* PPPL-CFP–2963			
15	19:2779	*See* PPPL-CFP–2965			
18	19:2745	*See* GA-A–21404			
19	19:2751	*See* GA-A–21437			
20	19:2743	*See* GA-A–21396			
23	19:2795	*See* UCRL-JC–114238			
24	19:2780	*See* PPPL-CFP–2971			
25	19:2782	*See* PPPL-CFP–2975			
27	19:2781	*See* PPPL-CFP–2973			
33	19:2784	*See* PPPL-CFP–2981			
35	19:2783	*See* PPPL-CFP–2976			
36	19:2730	*See* ANL/EP/CP–79902			
42	19:2770	*See* LA-UR–93-3677			
43	19:2769	*See* LA-UR–93-3648			
CONF-9310182–		(Workshop on beryllium for fusion applications; Karlsruhe (Germany); 4-5 Oct 1993)			
1	19:2767	*See* LA-UR–93-3396			
CONF-9310183–		(Measurement quality conference; Gaithersburg, MD (United States); 26-27 Oct 1993)			
1	19:2817	*See* SAND–93-2292C			
CONF-9310184–		(Symposium on silica, silicosis, and cancer; San Francisco, CA (United States); 28-30 Oct 1993)			
1	19:2262	*See* LA-UR–93-3353			
CONF-9310186–		(Environmental restoration on laser options; Atlanta, GA (United States); 24-28 Oct 1993)			
2	19:2095	*See* WSRC-MS–93-158			

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CONF-9310190–		(Double ionization in He; Argonne, IL (United States); 4 Oct 1993)			
1	19:2555	*See* LA-UR–93-3426			
CONF-9310193–		(CERN workshop on beam cooling and related topics; Geneva (Switzerland); 4-8 Oct 1993)			
1	19:1506	*See* SSCL-Preprint–511			
CONF-9310195–		(6. international symposium on laser-aided plasma diagnostics; Bar Harbor, ME (United States); 25-28 Oct 1993)			
1	19:2720	*See* SAND–93-2182C			
CONF-9310203–		(1993 American Society for Quality Control/American Statistics Association (ASQC/ASA) fall meeting; Rochester, NY (United States); 14-15 Oct 1993)			
1	19:1961	*See* SAND–93-1296C			
CONF-9310204–		(Beam instrumentation workshop; Santa Fe, NM (United States); 20-23 Oct 1993)			
2	19:1583	*See* ANL/ASD/CP–80717			
3	19:1546	*See* LA-UR–93-3724			
CONF-9310205–		(7. annual Colorado Hazardous Waste Society conference and exhibition; Denver, CO (United States); 13-15 Oct 1993)			
1	19:1977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002196	MF-940
CONF-931023–		(International conference on accelerator and large experimental control systems; Berlin (Germany); 18-22 Oct 1993)			
1	19:1531	*See* FNAL/C–93/288			
2	19:1469	*See* ANL/ASD/CP–79458			
CONF-931024–		(184. meeting of the Electrochemical Society; New Orleans, LA (United States); 10-15 Oct 1993)			
3	19:877	*See* ANL/CMT/CP–79617			
CONF-931039–		(6. workshop on RF superconductivity; Newport News, VA (United States); 4-8 Oct 1993)			
1	19:1513	*See* ANL/PHY/CP–80923			
2	19:1478	*See* LA-UR–93-3532			
CONF-931042–		(Annual meeting of the Geothermal Resources Council; San Francisco, CA (United States); 10-13 Oct 1993)			
6	19:603	*See* UCRL-JC–114119			
7	19:597	*See* LBL–34242			
CONF-931043–		(8. symposium on separation science and technology for energy applications; Knoxville, TN (United States); 17-21 Oct 1993)			
1	19:1148	*See* ANL/CMT/CP–79185			
CONF-931070–		(4. international workshop on plasma edge theory in fusion devices; Varenna (Italy); 4-6 Oct 1993)			
1	19:2692	*See* LA-UR–93-3502			
2	19:2717	*See* PPPL-CFP–2962			
3	19:2718	*See* PPPL-CFP–2964			
4	19:2725	*See* UCRL-JC–114695			
CONF-931079–		(Water reactor safety information meeting; Bethesda, MD (United States); 25-27 Oct 1993)			
	19:791	*See* NUREG/CP–0132			
3	19:775	*See* ANL/RE/CP–78893			
5	19:774	*See* ANL/ET/CP–81036			
6	19:777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002490	
CONF-931080–		(Visualization '93; San Jose, CA (United States); 25-29 Oct 1993)			
4	19:2863	*See* LA-UR–93-3140			
CONF-931081–		(34. ORNL/DOE conference on analytical chemistry in energy technology; Gatlinburg, TN (United States); 5-7 Oct 1993)			
1	19:2096	*See* WSRC-MS–93-390			
CONF-931087–		(3. world conference on experimental heat transfer, fluid mechanics and thermodynamics; Honolulu, HI (United States); 31 Oct - 5 nov 1993)			
2	19:1415	*See* ANL/FC/CP–76325			

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CONF-931095–		(Department of Energy environmental remediation conference; Augusta, GA (United States); 24-28 Oct 1993)			
1	19:278	*See* LA-UR–93-1914			
3	19:371	*See* WSRC-MS–93-284			
4	19:2194	*See* DOE/METC/C–93/7098			
5	19:239	*See* ANL/EA/CP–79596			
6	19:1894	*See* ANL/EAIS/CP–80792			
7	19:1974	*See* ANL/EAIS/CP–80710			
8	19:359	*See* WHC-SA–2078			
10	19:469	*See* WSRC-MS–93-224			
11	19:373	*See* WSRC-MS–93-444			
12	19:2098	*See* WSRC-MS–93-513			
14	19:393	*See* ANL/EA/CP–79944			
15	19:2097	*See* WSRC-MS–93-511			
16	19:1890	*See* WHC-SA–1939			
17	19:353	*See* WHC-SA–1935			
18	19:394	*See* ANL/EAIS/CP–79748			
19	19:240	*See* ANL/EAIS/CP–80858			
20	19:238	*See* ANL/DIS/CP–80955			
21	19:2184	*See* ANL/EA/CP–79756			
22	19:460	*See* WHC-SA–2058			
23	19:358	*See* WHC-SA–2062			
24	19:375	*See* WSRC-MS–93-555			
26	19:471	*See* WSRC-MS–93-481			
28	19:357	*See* WHC-SA–2055			
30	19:459	*See* WHC-SA–2057			
31	19:442	*See* SAND–93-1244C			
32	19:321	*See* SAND–93-2250C			
33	19:458	*See* WHC-SA–2056			
34	19:2089	*See* WHC-SA–2064			
35	19:461	*See* WHC-SA–2061			
39	19:449	*See* UCRL-JC–113790			
40	19:1973	*See* ANL/EA/CP–79679			
42	19:2088	*See* WHC-SA–1941			
43	19:443	*See* SAND–93-1261C			
44	19:244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002444	MF-400
45	19:429	*See* FEMP/SUB–064			
46	19:428	*See* FEMP–2306			
47	19:264	*See* FEMP–2307			
CONF-931102–		(International conference on speed technology for railway and maglev vehicles; Yokohama (Japan); 22-25 Nov 1993)			
1	19:917	*See* ANL/ES/CP–80771			
2	19:918	*See* ANL/ET/CP–80643			
CONF-931103–		(Joint MMIJ/TMS international conference on processing materials for properties; Honolulu, HI (United States); 7-10 Nov 1993)			
3	19:1123	*See* IS-M–763			
4	19:2598	*See* ANL/ET/CP–78724			
CONF-931107–		(Nuclear science symposium; San Francisco, CA (United States); 2-5 Nov 1993)			
5	19:478	*See* LA-UR–93-2972			
8	19:1808	*See* LA-UR–93-3811			
CONF-931108–		(Fall meeting of the Materials Research Society; Boston, MA (United States); 29 Nov - 3 dec 1993)			
3	19:236	*See* ANL/CMT/CP–79779			
CONF-9311101–		(GOMAC 93: government microcircuit application conference; New Orleans, LA (United States); 1-4 Nov 1993)			
1	19:1448	*See* SAND–93-0816C			
1	19:1837	*See* SAND–93-1965C			
2	19:951	*See* SAND–93-0521C			
3	19:2611	*See* SAND–93-1060C			
CONF-9311102–		(American Society for Precision Engineering (ASPE) conference; Seattle, WA (United States); 7-12 Nov 1993)			
1	19:1831	*See* UCRL-JC–115215			
3	19:1382	*See* LA-UR–93-3432			
4	19:1435	*See* LA-UR–93-3433			

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CONF-9311104–		(40. national symposium of the American Vacuum Society (AVS); Orlando, FL (United States); 15-19 Nov 1993)			
2	19:1134	*See* SAND–93-1107C			
3	19:2589	*See* ANL/CHM/CP–80916			
6	19:1449	*See* SAND–93-1127C			
CONF-9311107–		(ICAR '93: 6. international conference on advanced robotics; Tokyo (Japan); 1-2 Nov 1993)			
1	19:1377	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002193	MF-406
CONF-931115–		(Supercomputing conference on high performance computing and communications; Portland, OR (United States); 15-19 Nov 1993)			
12	19:2281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000328	MF-414
CONF-931121–		(Annual winter meeting of the American Society of Mechanical Engineers; New Orleans, LA (United States); 28 Nov - 3 dec 1993)			
14	19:387	*See* RFP–4746			
18	19:2564	*See* SAND–93-0887C			
21	19:2310	*See* LA-UR–93-3124			
22	19:2563	*See* LA-UR–93-3184			
24	19:1012	*See* IS-M–762			
25	19:2323	*See* UCRL-JC–114311			
27	19:2326	*See* UCRL-JC–115418			
28	19:2599	*See* ANL/MCT/CP–78916			
CONF-931133–		(38. annual conference on magnetism and magnetic materials; Minneapolis, MN (United States); 15-18 Nov 1993)			
1	19:1023	*See* LA-UR–93-3155			
2	19:1230	*See* ANL/CHM/CP–80906			
3	19:993	*See* ANL/MSD/CP–79906			
4	19:1110	*See* ANL/IPNS/CP–79847			
5	19:992	*See* ANL/MSD/CP–79360			
CONF-931142–		(1. meeting of the Pacific Rim ceramic societies; Honolulu, HI (United States); 7-10 Nov 1993)			
1	19:1090	*See* IS-M–771			
CONF-931160–		(American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993)			
1	19:370	*See* WSRC-MS–92-491			
18	19:779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000487	MF-400
20	19:491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000475	MF-413
21	19:756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000471	
22	19:1474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000470	MF-414
23	19:223	*See* WHC-SA–1821			
26	19:1407	*See* Y/DD–613			
27	19:230	*See* WHC-SA–2021			
28	19:1817	*See* ANL/FE/CP–80378			
CONF-931161–		(2. international low-level waste conference and exhibition; Monterey, CA (United States); 9-12 Nov 1993)			
1	19:226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001130	MF-603
CONF-931164–		(Annual meeting of the American Institute of Chemical Engineers; St. Louis, MO (United States); 7-12 Nov 1993)			
1	19:285	*See* LA-UR–93-3717			
CONF-931191–		(1993 international symposium on testing and failure analysis; Los Angeles, CA (United States); 15-19 Nov 1993)			
3	19:1452	*See* SAND–93-1874C			
CONF-931192–		(International Society for Hybrid Microcircuits (ISHM) annual meeting; Dallas, TX (United States); Nov 1993)			
1	19:1450	*See* SAND–93-1626C			
CONF-931207–		(DOE low-level radioactive waste management conference; Phoenix, AZ (United States); 1-3 Dec 1993)			
1	19:1404	*See* WSRC-MS–93-286			

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CONF-931208–		(Winter simulation conference; Los Angeles, CA (United States); 12-15 Dec 1993)			
1	19:1389	*See* SAND–93-0922C			
CONF-931215–		(International electron devices meeting; Washington, DC (United States); 5-8 Dec 1993)			
1	19:1220	*See* SAND–93-1617C			
CONF-931220–		(5. Institute of Electrical and Electronics Engineers (IEEE) symposium on parallel and distributed processing; Dallas, TX (United States); 1-4 Dec 1993)			
1	19:2874	*See* SAND–93-1249C			
CONF-931226–		(Institute of Electrical and Electronics Engineers (IEEE) semiconductor interface specialists conference; Ft. Lauderdale, FL (United States); 9-11 Dec 1993)			
1	19:2569	*See* SAND–93-1927C			
CONF-931227–		(Winter school-cum-workshop on organometallic chemistry; New Delhi (India); 6-8 Dec 1993)			
1	19:7	*See* BNL–49390			
CONF-931232–		(1. international symposium on process industry piping; Orlando, FL (United States); 14-17 Dec 1993)			
1	19:1067	*See* WSRC-MS–93-010			
CONF-940101–		(11. symposium on space nuclear power systems; Albuquerque, NM (United States); 9-13 Jan 1994)			
2	19:354	*See* WHC-SA–1975			
3	19:1095	*See* LA-UR–93-3060			
4	19:719	*See* LA-UR–93-3324			
6	19:747	*See* SAND–93-7080C			
8	19:1384	*See* LA-UR–93-3518			
11	19:720	*See* LA-UR–93-3361			
13	19:722	*See* WINCO–11981			
CONF-940113–		(13. Energy-sources technology conference and exhibition (ETCE) on wind energy; New Orleans, LA (United States); 23-26 Jan 1994)			
2	19:645	*See* SAND–93-1375C			
CONF-940115–		(74. American Meteorological Society annual meeting; Nashville, TN (United States); 23-28 Jan 1994)			
1	19:1958	*See* RFP–4763			
7	19:1899	*See* BNL–49530			
CONF-940126–		(Energy-sources technology conference and exhibition; New Orleans, LA (United States); 23-26 Jan 1994)			
1	19:604	*See* LA-UR–93-3134			
CONF-940130–		(Symposium on discrete algorithms; Arlington, VA (United States); 23-26 Jan 1994)			
1	19:2876	*See* SAND–93-1866C			
CSNAS–					
0059.	19:2166	*See* CNIC–00636			
0062.	19:2167	*See* CNIC–00663			
0063.	19:2191	*See* CNIC–00666			
0064.	19:2169	*See* CNIC–00681			
0065.	19:1976	*See* CNIC–00688			
CSTS–					
43-93	19:982	*See* UCRL-JC–114402			
CTH-IEFT-PP–					
1992-30	19:2624	OSTI; NTIS; INIS		DE94606759	
1993-07	19:2625	OSTI; NTIS; INIS		DE94606760	
1993-08	19:2626	OSTI; NTIS; INIS		DE94606796	
1993-10	19:2627	OSTI; NTIS; INIS		DE94606761	
1993-12	19:2628	OSTI; NTIS; INIS		DE94606777	
1993-14	19:2629	OSTI; NTIS; INIS		DE94606770	
CWP–					
139	19:2254	*See* DOE/ER/14079–27			
DL/SCI/TM–					
94E	19:1524	OSTI; NTIS (US Sales Only); INIS		DE94604559	
DOE-HMIP-RR–					
92.057	19:249	OSTI; NTIS (US Sales Only); INIS		DE94606148	
92.102	19:250	OSTI; NTIS (US Sales Only); INIS		DE94606149	

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92.12	19:248	OSTI; NTIS (US Sales Only); INIS		DE94604665	
93.034	19:251	OSTI; NTIS (US Sales Only); INIS		DE94606150	
DOE-TSL–					
1-93-Rev.1	19:2805	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000425	MF-500
DOE/AL–					
0347	19:396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001479	MF-902
DOE/AL/31950–					
T5	19:487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001589	MF-902
DOE/AL/62350–					
32D	19:398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001509	MF-902
36PF	19:245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001475	MF-902
38F	19:399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001478	MF-940
43D	19:400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001510	MF-902; MF-903
48D	19:401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001513	MF-903
53F	19:402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001511	MF-902
54D	19:403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001508	MF-902
68F	19:404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001512	MF-902
70F	19:405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001481	MF-902
9F	19:397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001477	MF-900
DOE/BC–					
92/4	19:71	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000129	PC-122
DOE/BC/14474–					
15	19:72	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001745	MF-122
DOE/BC/14831–					
4	19:73	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001748	MF-122
DOE/BC/14886–					
3	19:74	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001746	MF-122
DOE/BC/14954–					
2	19:75	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001744	MF-122
DOE/BC/14956–					
2	19:68	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001747	MF-122
DOE/BP–					
2105	19:810	*See* DOE/EIS–0145			
2161	19:671	*See* DOE/EIS–0194			
2211	19:2801	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000944	MF-900
DOE/BP/15474–					
T1	19:821	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018974	MF-920
DOE/BP/21985–					
4	19:547	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000947	MF-902
7	19:548	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000949	MF-902
DOE/BP/25174–					
2	19:892	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002323	MF-920
3	19:893	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000975	MF-920
4	19:894	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002324	MF-920
5	19:895	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002325	MF-920
6	19:896	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000977	MF-920
7	19:897	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002326	MF-920
8	19:898	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002327	MF-920
9	19:899	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002328	MF-920
10	19:900	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002329	MF-920
11	19:901	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002330	MF-920
12	19:902	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002331	MF-920
DOE/BP/60629–					
6	19:551	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000945	MF-902
DOE/CE–					
0263(03/93)	19:903	OSTI; NTIS; GPO Dep.	E 1.99:	DE93017521	MF-350
DOE/CE/15500–					
T3	19:1810	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019260	MF-252
DOE/CE/23821–					
T2	19:904	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000974	MF-350
DOE/CE/27504–					
T3	19:954	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001443	MF-350
DOE/CE/90052–					
T1	19:1082	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000746	MF-310
DOE/CH–					
9206	19:406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040739	MF-903
DOE/EA–					
0326	19:167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001480	MF-630
0339	19:407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041026	MF-902
0464-Rev.1	19:408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041037	MF-902

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DOE/EA–					
0467-Rev.	19:552	OSTI; NTIS; GPO Dep.	E 1.99:	DE93016648	MF-630
0467-Rev.-App.	19:549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016649	MF-630
0785	19:409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016873	MF-940
0804	19:91	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000979	MF-630
0835	19:1978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017298	MF-630
0854	19:410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001265	MF-630
0881	19:411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001263	MF-630
DOE/EE–					
0003	19:972	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040664	MF-333
0004	19:977	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040663	MF-334
DOE/EH–					
0337T	19:2607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041103	MF-630
0346	19:1888	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001713	PC-630
DOE/EIA–					
0130(93/09)	19:133	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94000664	MF-950
0226(93/07)	19:869	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE93018401	MF-950
0380(93/10)	19:82	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001360	MF-950
0520(93/08)	19:83	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE93040830	MF-950
0520(93/09)	19:84	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000756	MF-950
0538(93/94-1)	19:85	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94001363	MF-950
0538(93/94-2)	19:86	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001841	MF-950
M053	19:550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040456	MF-950
TR-0574	19:134	OSTI; NTIS; GPO; INIS; GPO Dep.	E 1.99:	DE94001840	MF-950
DOE/EIS–					
0145	19:810	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001268	MF-630
0185F	19:412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001264	MF-511
0194	19:671	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001267	MF-630
DOE/EM–					
0099	19:246	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001564	MF-900
0105P	19:2802	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001561	MF-900
DOE/EP/79129–					
T1	19:87	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001248	MF-900
DOE/ER–					
0594P	19:1475	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040413	PC-400
0604P	19:2803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002498	MF-400
DOE/ER/00881–					
T4	19:2379	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001908	MF-414
DOE/ER/12130–					
1	19:999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002334	MF-404
DOE/ER/12891–					
4	19:176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001729	MF-406
DOE/ER/13373–					
T3	19:1243	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001582	MF-401
DOE/ER/13406–					
8	19:1244	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002313	MF-401
DOE/ER/13537–					
2	19:30	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000876	MF-400
T6	19:31	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000871	MF-400
DOE/ER/13567–					
2	19:1420	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040700	MF-400
4	19:1421	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040702	MF-406
DOE/ER/13582–					
T3	19:1245	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001647	MF-401
DOE/ER/13613–					
45	19:1155	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001639	MF-401; MF-408
DOE/ER/13664–					
4	19:1275	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002312	MF-401
DOE/ER/13777–					
T2	19:1246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001867	MF-401
DOE/ER/13790–					
5	19:1247	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001798	MF-401
DOE/ER/13795–					
T1	19:2252	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001653	MF-403
DOE/ER/13914–					
16	19:1276	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001650	MF-401
DOE/ER/13951–					
5	19:247	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000657	MF-402
DOE/ER/13958–					
43	19:2530	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001588	MF-411

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/13988–					
T2	19:1368	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002181	MF-406
DOE/ER/14052–					
3	19:2737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001790	MF-421
DOE/ER/14061–					
2	19:2253	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000745	MF-403
DOE/ER/14079–					
27	19:2254	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000875	MF-403
DOE/ER/14121–					
2	19:1248	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000971	MF-401
DOE/ER/14224–					
T1	19:1156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001651	MF-411
DOE/ER/14244–					
1	19:1820	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001375	MF-403; MF-401
DOE/ER/20054–					
2	19:2130	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001584	MF-408
DOE/ER/25068–					
2	19:2842	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001586	MF-405
DOE/ER/40150–					
213	19:1525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017511	MF-414
215	19:1526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93017509	MF-406
229	19:1588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040859	MF-414
232	19:1490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040866	MF-414
234	19:1527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040860	MF-414
236	19:2380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040868	MF-414
238	19:2405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040867	MF-414
240	19:2406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040869	MF-414
DOE/ER/40412–					
1	19:2357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000785	MF-414
DOE/ER/40661–					
6	19:1614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000962	MF-414
DOE/ER/45076–					
3	19:1157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001738	MF-411
T2	19:1158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001368	MF-411
DOE/ER/45127–					
9	19:2562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002672	MF-410; MF-404
DOE/ER/45337–					
T5	19:1000	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001444	MF-404
DOE/ER/45428–					
T1	19:1083	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001441	MF-404; MF-406
DOE/ER/45429–					
2	19:1615	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019936	MF-406
DOE/ER/53198–					
223	19:2630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001574	PC-426
224	19:2631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001575	PC-426
226	19:2632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002318	MF-426
DOE/ER/53218–					
22	19:2633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000778	MF-427
DOE/ER/53264–					
4	19:2738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001369	MF-420
DOE/ER/60408–					
5	19:2162	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001053	MF-408
DOE/ER/61010–					
T11	19:98	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040797	MF-402
DOE/ER/61029–					
15	19:1904	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000878	MF-410
DOE/ER/61420–					
1	19:2133	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041281	MF-408
DOE/ER/61442–					
1	19:2163	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041280	MF-408
DOE/ER/75660–					
2	19:2804	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001643	MF-400
DOE/ER/79119–					
1	19:1821	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001224	MF-406
DOE/ER/80998–					
93/C0217	19:9	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019956	MF-402
DOE/ER/81186–					
94/C0265	19:881	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001924	MF-110

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ET/51013–					
302	19:2615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001725	MF-422
DOE/ET/53088–					
602	19:2634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001231	MF-421
614	19:2635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001232	MF-421
621	19:2636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001233	MF-420
623	19:2637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001234	MF-420
626	19:2739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001235	MF-421
DOE/FE–					
0283	19:94	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001715	MF-126
DOE/FE/62046–					
H1	19:61	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000431	MF-101
H2	19:62	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000430	MF-101
DOE/FTR–					
93013879	19:554	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93013879	MF-233
93015806	19:589	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93015806	MF-257
93018763	19:920	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93018763	MF-330
DOE/IG–					
0327	19:413	OSTI (Free of Charge); INIS		TI94001579	PC-960
0332	19:2799	OSTI (Free of Charge)		TI93040807	PC-960
DOE/MC/10637–					
93/C0204	19:32	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019864	MF-106; MF-109
DOE/MC/11076–					
3380	19:162	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000298	MF-123; MF-125
3410	19:164	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011306	MF-123; MF-126
3411	19:1822	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011307	MF-106
3424	19:76	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011301	MF-122
3425	19:90	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011302	MF-123
DOE/MC/21023–					
93/C0210	19:646	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040921	MF-103; MF-104
93/C0211	19:647	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040922	MF-103; MF-104
93/C0212	19:662	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040923	MF-103; MF-114
DOE/MC/23166–					
3414	19:648	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041130	MF-111
DOE/MC/23170–					
93/C0228	19:649	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019860	MF-111
DOE/MC/24132–					
93/C0234	19:50	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019876	MF-103; MF-106
DOE/MC/24207–					
3323	19:51	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000259	MF-103
3324	19:52	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000260	MF-103
3325	19:1422	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000261	MF-103
3326	19:1001	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000262	MF-103
DOE/MC/24257–					
93/C0216	19:663	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040373	MF-106
DOE/MC/25003–					
93/C0218	19:10	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019862	MF-103; MF-106
DOE/MC/25034–					
93/C0231	19:664	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019874	MF-114
DOE/MC/25140–					
93/C0224	19:665	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040919	MF-106; MF-114
93/C0225	19:11	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040920	MF-103; MF-104; MF-106
DOE/MC/25177–					
3307	19:650	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000251	PC-103
93/C0226	19:53	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040377	MF-103; MF-106; MF-111
DOE/MC/26018–					
3438	19:2239	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000873	MF-109
3439	19:67	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000872	MF-109

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/MC/26031–					
12	19:77	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001737	MF-122
DOE/MC/26040–					
93/C0220	19:1159	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019877	MF-106; MF-114
DOE/MC/26042–					
93/C0213	19:666	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040376	MF-106
DOE/MC/26288–					
93/C0223	19:651	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040378	MF-106
DOE/MC/26308–					
3466	19:652	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000005	MF-106; MF-109; MF-111
DOE/MC/26365–					
3423	19:515	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000290	PC-109
DOE/MC/26366–					
3456	19:1160	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001728	MF-106
DOE/MC/26367–					
3461	19:12	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001313	MF-109
3463	19:13	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001314	MF-102; MF-109
DOE/MC/26372–					
93/C0202	19:14	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019870	MF-106; MF-114
DOE/MC/27224–					
93/C0199	19:1118	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019292	MF-106
DOE/MC/27233–					
93/C0209	19:15	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019863	MF-107; MF-109
DOE/MC/27364–					
93/C0227	19:54	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019859	MF-111
93/C0229	19:55	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019898	MF-103
DOE/MC/27391–					
3479	19:16	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001734	MF-109; MF-106
DOE/MC/27394–					
94/C0263	19:882	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001918	MF-110
DOE/MC/27423–					
93/C0215	19:667	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040374	MF-106; MF-114
DOE/MC/28016–					
93/C0222	19:1905	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019894	MF-106
DOE/MC/28060–					
93/C0232	19:926	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019875	MF-103; MF-107
DOE/MC/28065–					
94/C0249	19:883	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001920	MF-110
DOE/MC/28087–					
3464	19:99	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001311	MF-132
DOE/MC/28176–					
3455	19:101	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011304	MF-132
DOE/MC/29220–					
93/C0221	19:1161	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019858	MF-106; MF-107
DOE/MC/29245–					
93/C0205	19:1162	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019865	MF-106; MF-114
DOE/MC/29246–					
3460	19:18	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001315	MF-106
93/C0219	19:17	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019896	MF-106
DOE/MC/30126–					
93/C0200	19:1163	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019355	MF-114
DOE/METC/C–					
93/7089	19:56	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019871	MF-103; MF-104
93/7091	19:159	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019737	MF-103; MF-104
93/7092	19:668	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019738	MF-106
93/7095	19:19	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019740	MF-109
93/7096	19:20	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019739	MF-109
93/7097	19:653	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019866	MF-111

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DOE/METC/C–					
93/7098	19:2194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041131	MF-902
93/7099	19:57	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019734	MF-106; MF-109; MF-111
93/7102	19:1164	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040379	MF-114; MF-115
DOE/MWIP–					
3-Vol.1	19:252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040594	MF-902
DOE/NASA–					
1087-2	19:966	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001711	MF-336
DOE/NASA/0335–					
5	19:965	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040366	MF-336
DOE/NBM–					
94000017	19:884	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000017	MF-110; MF-115
DOE/NV–					
209-Rev.13	19:1859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016551	MF-700
DOE/NV/10576–					
T6	19:253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000959	MF-600
DOE/NV/10872–					
T59	19:1423	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018959	MF-814
T84	19:254	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002515	MF-814
DOE/OR–					
01-1115-D2	19:414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001950	MF-902
01-1117/V1	19:415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002243	MF-902
01-1167-D1	19:227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000424	MF-902
01-1168-D2	19:416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001658	MF-902
DOE/OR/00033–					
T532	19:178	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000826	MF-506
T533	19:2740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000827	MF-421
T534	19:1439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000828	MF-420
T538	19:1165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000832	MF-800
T540	19:2195	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000834	MF-507
T544	19:255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000838	MF-810
T545	19:2638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000839	MF-421
T546	19:1979	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000840	MF-901
T551	19:751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000845	MF-524
T553	19:1119	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000847	MF-906
T556	19:2196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000850	MF-406
T560	19:417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001402	MF-408
T567	19:1980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001410	MF-902
T571	19:1616	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001414	MF-406
DOE/OR/21411–					
T2	19:1084	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019599	MF-336
DOE/OR/21607–					
2	19:2197	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000854	MF-402
T6	19:418	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000859	MF-402
T7	19:1981	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000861	MF-402
DOE/OR/21971–					
T2	19:419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041149	MF-502
DOE/OR/22089–					
2	19:2255	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001613	MF-250
DOE/PC/79672–					
T7	19:875	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001974	MF-112
DOE/PC/88818–					
T2	19:21	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041182	PC-108
DOE/PC/89785–					
13	19:1249	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001954	MF-113
15	19:33	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002049	MF-113
DOE/PC/90046–					
T1	19:546	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002157	MF-108
DOE/PC/90310–					
T12	19:58	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002179	MF-113
DOE/PC/91283–					
T8	19:34	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002402	MF-102
T9	19:35	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002401	MF-102
DOE/PC/91309–					
T9	19:1085	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001966	MF-114
DOE/PC/92106–					
T3	19:1250	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002176	MF-114

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/PO–					
0001	19:978	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040662	MF-920
DOE/RL–					
91-40	19:420	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041114	MF-900
91-45-Rev.2	19:421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016766	MF-630
92-29	19:1982	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001179	MF-900
92-70-Vol.1	19:422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000788	MF-630
93-19	19:1983	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001172	MF-900
93-27	19:423	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041112	MF-630
93-44	19:256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041189	MF-630; MF-721
93-48	19:257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001702	MF-630
93-64	19:424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001695	MF-630
93-70	19:258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041134	MF-630; MF-721
DOE/RL/12089–					
T2	19:1815	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000565	MF-402; MF-406
DOE/SF/18852–					
T31	19:509	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001445	MF-528
DOE/SF/19441–					
T4	19:718	OSTI; NTIS; GPO Dep.	E 1.99:	DE93013969	MF-528
DOE/SR/18035–					
T1-Exec.Summ.	19:762	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93019363	MF-1000
T1-Vol.3	19:763	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93019374	MF-1000
DOE/WIPP–					
91-058	19:259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000734	MF-721
93-019-Vol.2	19:260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041191	MF-903
93-033	19:261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001838	MF-902; MF-906
DP–					
403	19:752	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001139	MF-706
403-TL	19:752	*See* DP–403			
DTP–					
93/22.	19:2416	*See* RAL–93-027			
EDF–					
93-NB-00022	19:695	OSTI; NTIS (US Sales Only); INIS		DE94605939	
93-NB-00023	19:696	OSTI; NTIS (US Sales Only); INIS		DE94605940	
93-NB-00024	19:697	OSTI; NTIS (US Sales Only); INIS		DE94605941	
93-NJ-00006	19:698	OSTI; NTIS (US Sales Only); INIS		DE94605942	
93-NJ-00007	19:699	OSTI; NTIS (US Sales Only); INIS		DE94605943	
93-NJ-00008	19:700	OSTI; NTIS (US Sales Only); INIS		DE94605944	
EGG–					
2678(92)	19:1984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002897	MF-902
2712	19:22	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041252	PC-102
EGG-EEL–					
10752	19:1985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002808	MF-602
EGG-ERD–					
10453	19:1986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002883	MF-902
EGG-M–					
93041	19:1600	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018936	MF-906
EGG-MS–					
10781	19:734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002860	
EGG-PIR–					
10633(2Q-93)	19:850	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002837	MF-900
EGG-WM–					
10661	19:2240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002840	MF-902
EGG-WTD–					
10660	19:1987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002841	MF-902
10813	19:262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002881	MF-940
ENEA-RT-AMB–					
90-30	19:525	OSTI; NTIS (US Sales Only)		DE94716513	
92-07	19:1906	OSTI; NTIS (US Sales Only)		DE94716516	
ENEA-RT-ERG–					
93-09	19:1086	OSTI; NTIS (US Sales Only)		DE94716604	
ENEA-RT-ERG-NUC–					
93-10	19:1617	OSTI; NTIS (US Sales Only)		DE94716521	
ENEA-RT-INN–					
92-13	19:526	OSTI; NTIS (US Sales Only)		DE94716524	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
ENEA-RT-INN–					
92-14	19:1002	OSTI; NTIS (US Sales Only)		DE94716515	
92-39	19:1440	OSTI; NTIS (US Sales Only)		DE94716542	
92-42	19:2588	OSTI; NTIS (US Sales Only)		DE94716574	
92-46	19:1441	OSTI; NTIS (US Sales Only)		DE94716525	
92-48	19:2843	OSTI; NTIS (US Sales Only)		DE94716523	
ENEA-RT-NUCL–					
92-27	19:2639	OSTI; NTIS (US Sales Only)		DE94716590	
92-28	19:2640	OSTI; NTIS (US Sales Only)		DE94716602	
92-38	19:2844	OSTI; NTIS (US Sales Only)		DE94716522	
ENEA-RTI-INN–					
93-02	19:1528	OSTI; NTIS (US Sales Only)		DE94716597	
EPA–					
600/R-93/141	19:1907	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002296	MF-702
ES/ER/TM–					
36	19:1988	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000601	MF-902
90	19:425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001032	MF-902
91	19:426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001034	MF-902
92	19:427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001035	MF-902
ES/ESH–					
31/V1	19:381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001847	MF-902
31/V2	19:382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001848	MF-902
36	19:1908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001937	MF-902
37	19:1909	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001936	MF-902
ESTSC–					
000324SUN0002	19:2845	ESTSC; Lawrence Livermore National Lab			
000605SPARC00	19:2846	ESTSC			
000616IBMPC00	19:2847	ESTSC			
ESTSC/NRC–					
000096I303300	19:2848	ESTSC			
ETDE-GB–					
507	19:673	OSTI; NTIS (US Sales Only); INIS		DE94706281	
508	19:674	OSTI; NTIS (US Sales Only); INIS		DE94706282	
ETDE-IT–					
93-198	19:813	OSTI; NTIS (US Sales Only)		DE93522936	
93-219	19:2241	OSTI; NTIS (US Sales Only)		DE94716510	
93-220	19:2641	OSTI; NTIS (US Sales Only)		DE94716512	
93-221	19:764	OSTI; NTIS (US Sales Only)		DE94716514	
93-222	19:59	OSTI; NTIS (US Sales Only)		DE94716520	
93-223	19:155	OSTI; NTIS (US Sales Only); INIS		DE94716531	
93-224	19:157	OSTI; NTIS (US Sales Only)		DE94716532	
93-225	19:138	OSTI; NTIS (US Sales Only); INIS		DE94716533	
93-226	19:927	OSTI; NTIS (US Sales Only)		DE94716534	
93-227	19:135	OSTI; NTIS (US Sales Only); INIS		DE94716535	
93-228	19:885	OSTI; NTIS (US Sales Only)		DE94716536	
93-229	19:654	OSTI; NTIS (US Sales Only); INIS		DE94716537	
93-230	19:655	OSTI; NTIS (US Sales Only)		DE94716538	
93-231	19:886	OSTI; NTIS (US Sales Only)		DE94716539	
93-232	19:656	OSTI; NTIS (US Sales Only); INIS		DE94716540	
93-233	19:657	OSTI; NTIS (US Sales Only); INIS		DE94716541	
93-234	19:780	OSTI; NTIS (US Sales Only)		DE94716555	
93-235	19:781	OSTI; NTIS (US Sales Only)		DE94716556	
93-236	19:565	OSTI; NTIS (US Sales Only)		DE94716557	
93-237	19:2134	OSTI; NTIS (US Sales Only)		DE94716572	
93-238	19:263	OSTI; NTIS (US Sales Only)		DE94716573	
93-239	19:1378	OSTI; NTIS (US Sales Only)		DE94716591	
93-240	19:887	OSTI; NTIS (US Sales Only)		DE94716592	
93-241	19:581	OSTI; NTIS (US Sales Only); INIS		DE94716593	
93-242	19:782	OSTI; NTIS (US Sales Only)		DE94716594	
93-243	19:2198	OSTI; NTIS (US Sales Only)		DE94716595	
93-244	19:1120	OSTI; NTIS (US Sales Only)		DE94716596	
93-245	19:81	OSTI; NTIS (US Sales Only)		DE94716598	
93-246	19:1379	OSTI; NTIS (US Sales Only)		DE94716603	
ETDE/JP-mf–					
94714701	19:2105	OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan		DE94714701	
94714702	19:1910	OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan		DE94714702	
94714703	19:39	OSTI; NTIS; Available from National Institute for Resources and Environment, 16-3, Onogawa, Tsukuba, Ibaraki, Japan		DE94714703	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94714705	19:590	OSTI; NTIS; Available from Geological Survey of Japan, 1-3, Yatabemachi Higashi 1-chome, Tsukuba, Ibaraki, Japan		DE94714705	
94714745	19:856	OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-39-3 Nishi-Shinbashi, Minato-Ku, Tokyo, Japan		DE94714745	
94714761	19:858	OSTI; NTIS; Available from The Energy Conservation Center, Japan, 2-29-3 Nishi-Shinbashi, Minato-ku, Tokyo, Japan		DE94714761	
94714917	19:598	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714917	
94714918	19:599	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714918	
94714919	19:600	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714919	
94714920	19:601	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714920	
ETSU-B–					
1271	19:527	OSTI; NTIS (US Sales Only)		DE94716700	
1291	19:517	OSTI; NTIS (US Sales Only)		DE94716691	
1311	19:539	OSTI; NTIS (US Sales Only)		DE94708973	
1325	19:528	OSTI; NTIS (US Sales Only)		DE94716699	
1359	19:545	OSTI; NTIS (US Sales Only)		DE94711469	
1366	19:541	OSTI; NTIS (US Sales Only)		DE94711476	
ETSU-B/B–					
2/00148/REP	19:529	OSTI; NTIS (US Sales Only)		DE94716702	
ETSU-B/FW–					
00234/REP	19:542	OSTI; NTIS (US Sales Only)		DE94711473	
ETSU-B/SF–					
00196/REP	19:530	OSTI; NTIS (US Sales Only)		DE94716701	
00202/REP	19:531	OSTI; NTIS (US Sales Only)		DE94716703	
ETSU-B/W–					
1/00146/REP	19:543	OSTI; NTIS (US Sales Only)		DE94711470	
1/00146/REP/A	19:532	OSTI; NTIS (US Sales Only)		DE94711471	
5/00241/REP	19:518	OSTI; NTIS (US Sales Only)		DE94716704	
ETSU-N–					
121	19:624	OSTI; NTIS (US Sales Only)		DE94708901	
123	19:614	OSTI; NTIS (US Sales Only); INIS		DE94708900	
ETSU-R–					
72-Vol.2	19:611	OSTI; NTIS (US Sales Only)		DE94711478	
75	19:514	OSTI; NTIS (US Sales Only); INIS		DE94708972	
ETSU-S–					
1218-P1	19:582	OSTI; NTIS (US Sales Only)		DE94716696	
1218-P2	19:583	OSTI; NTIS (US Sales Only)		DE94716697	
1218-P3	19:584	OSTI; NTIS (US Sales Only)		DE94716698	
1249	19:585	OSTI; NTIS (US Sales Only)		DE94706283	
1329-P1	19:555	OSTI; NTIS (US Sales Only)		DE94708974	
ETSU-S/P–					
2/00131/REP	19:566	OSTI; NTIS (US Sales Only)		DE94716690	
ETSU-T–					
04/00171/REP	19:609	OSTI; NTIS (US Sales Only); INIS		DE94711474	
ETSU-TID–					
4114	19:610	OSTI; NTIS (US Sales Only); INIS		DE94716689	
ETSU-W–					
11/00342/04/01/REP	19:636	OSTI; NTIS (US Sales Only)		DE94716705	
11/00342/04/02/REP	19:637	OSTI; NTIS (US Sales Only)		DE94716706	
11/00342/04/REP	19:638	OSTI; NTIS (US Sales Only)		DE94716707	
43/00147/REP	19:639	OSTI; NTIS (US Sales Only)		DE94716693	
ETSU-WN–					
5113	19:640	OSTI; NTIS (US Sales Only)		DE94716692	
6037	19:641	OSTI; NTIS (US Sales Only)		DE94716694	
EUR–					
13249	19:967	OSTI; NTIS (US Sales Only)		TI94716427	

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13341	19:2259	OSTI; NTIS (US Sales Only)		TI94716435	
13499	19:968	OSTI; NTIS (US Sales Only)		TI94716437	
13570	19:931	OSTI; NTIS (US Sales Only)		TI94716407	
13920	19:932	OSTI; NTIS (US Sales Only)		TI94716411	
14003	19:1911	OSTI; NTIS (US Sales Only)		TI94716438	
14068	19:24	OSTI; NTIS (US Sales Only)		TI94716439	
14084	19:567	OSTI; NTIS (US Sales Only)		TI94716414	
14119	19:568	OSTI; NTIS (US Sales Only)		TI94716413	
14121	19:569	OSTI; NTIS (US Sales Only)		TI94716401	
14135	19:570	OSTI; NTIS (US Sales Only)		TI94716403	
14137	19:571	OSTI; NTIS (US Sales Only)		TI94716405	
14229	19:933	OSTI; NTIS (US Sales Only)		TI94716417	
14255	19:572	OSTI; NTIS (US Sales Only)		TI94716418	
14362	19:934	OSTI; NTIS (US Sales Only)		TI94716419	
14371	19:935	OSTI; NTIS (US Sales Only)		TI94716394	
14391	19:936	OSTI; NTIS (US Sales Only)		TI94716420	
14404	19:533	OSTI; NTIS (US Sales Only)		TI94716421	
14422	19:937	OSTI; NTIS (US Sales Only)		TI94716409	
14430	19:888	OSTI; NTIS (US Sales Only)		TI94716423	
14439	19:160	OSTI; NTIS (US Sales Only)		TI94716440	
14458	19:642	OSTI; NTIS (US Sales Only)		TI94716443	
14523	19:573	OSTI; NTIS (US Sales Only)		TI94716425	
14607	19:643	OSTI; NTIS (US Sales Only)		TI94716431	
14636	19:88	OSTI; NTIS (US Sales Only)		TI94716429	
14690	19:383	OSTI; NTIS (US Sales Only); INIS		TI94604138	
14746	19:659	OSTI; NTIS (US Sales Only)		TI94716445	
14753	19:644	OSTI; NTIS (US Sales Only)		TI94716447	
EUR-CEA-FC–					
1474	19:2642	OSTI; NTIS (US Sales Only); INIS		TI94604987	
FEI–					
2244	19:2849	OSTI; NTIS (US Sales Only); INIS		DE94606270	
2247	19:1006	OSTI; NTIS (US Sales Only); INIS		DE94605337	
FEMP–					
2306	19:428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002550	MF-902
2307	19:264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002556	MF-902
FEMP/SUB–					
064	19:429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002557	MF-902
FNAL-TM–					
1555	19:1532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002341	MF-411
1851	19:1999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002433	MF-414
1853	19:1533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001353	MF-414
1856	19:1491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000574	MF-414
FNAL/C–					
93/009-E	19:2381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002301	MF-414
93/180-E	19:2382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000576	MF-414
93/196-A	19:2333	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001505	MF-412
93/197	19:2383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000592	MF-414
93/203-E	19:2407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000580	MF-414
93/212-E	19:2408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002302	MF-414
93/213-E	19:2334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000591	MF-414
93/216-E	19:2384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001216	MF-414
93/227	19:1529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000593	MF-414
93/229	19:1530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000619	MF-414
93/251	19:2385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000618	MF-414
93/252-E	19:2386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000597	MF-414
93/266	19:2387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001219	MF-414
93/268	19:2358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001499	MF-414
93/271-E	19:2388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001218	MF-414
93/273-E	19:2389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001221	MF-414
93/288	19:1531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001217	MF-414
FSU-HEP–					
930815	19:2415	*See* LBL–34232			
930830	19:2375	*See* BNL–49462			
GA-A–					
21349	19:2741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040371	MF-420
21381	19:2742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001110	MF-421
21396	19:2743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001106	MF-426
21403	19:2744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001101	MF-420
21404	19:2745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001104	MF-426
21413	19:2650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001214	MF-420
21414	19:2746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001100	MF-420

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21416	19:2747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001113	MF-426
21417	19:2748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001213	MF-420
21428	19:2749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001103	MF-420
21429	19:2750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001112	MF-420
21437	19:2751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001105	MF-426
21439	19:2752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001098	MF-420
21440	19:2753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001102	MF-420
21446	19:2754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001195	MF-420
GARRETT–					
31-8071(05)	19:965	*See* DOE/NASA/0335–5			
GC–					
37/1060.	19:2811	*See* INIS-mf–13715			
37/INF/317.	19:2812	*See* INIS-mf–13716			
GEO–					
2826.	19:251	*See* DOE-HMIP-RR–93.034			
GL–					
93-13	19:419	*See* DOE/OR/21971–T2			
GRI–					
93/0119	19:102	*See* SAND–93-7041			
GTK-TUTK–					
98	19:2000	OSTI; NTIS; INIS		DE94605451	
GTK-YST–					
82	19:2001	OSTI; NTIS; INIS		DE94605452	
HAN–					
27115	19:765	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001618	MF-700
HD-THEP–					
93-26	19:2864	*See* LBL–34384			
HIFAN–					
576	19:2771	*See* LBL–34107			
HUPhy–					
01-93	19:2406	*See* DOE/ER/40150–240			
HW–					
10307	19:767	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001141	MF-520
10339	19:768	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001140	MF-520
24800-97	19:384	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001619	MF-606
3-1812	19:179	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001616	MF-711
30306	19:2199	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001620	MF-600
43561-RD	19:265	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040985	MF-711
45119	19:180	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001626	MF-711
45511	19:475	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001625	MF-711
46396	19:212	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040784	MF-711
48325	19:213	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040980	MF-711
52740	19:214	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001623	MF-711
55283	19:181	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93041096	MF-711
55963-RD	19:215	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040785	MF-711
57225	19:182	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001665	MF-700
57686	19:266	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93041095	MF-711
59938	19:725	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040786	MF-711
61570-Del.	19:183	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000422	MF-711
64162	19:216	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040788	MF-700
64450	19:217	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000423	MF-711
67666	19:218	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001143	MF-711
69011	19:267	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001142	MF-711
7-991-Del.	19:766	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001617	MF-700
79645	19:219	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93040984	MF-711
IAE–					
0103.	19:2189	*See* CNIC–00610			
0104.	19:1282	*See* CNIC–00627			
0105.	19:1242	*See* CNIC–00632			
0107.	19:1471	*See* CNIC–00646			
0108.	19:1472	*See* CNIC–00647			
0109.	19:211	*See* CNIC–00648			
0112.	19:1154	*See* CNIC–00664			
0113.	19:749	*See* CNIC–00677			
IAEA-CN–					
56/C-1-4	19:2696	*See* NIFS–176			
56/C-2-5	19:2776	*See* NIFS–186			
56/C-4-2	19:2774	*See* NIFS–177			
56/E-2-3	19:2698	*See* NIFS–181			
56/G-1-1-3(R)	19:2775	*See* NIFS–180			
56/H	19:2701	*See* NIFS–187			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
IAEA-CN–					
56/H-1-3	19:2702	*See* NIFS–198			
IAEA-TECDOC–					
713	19:2005	OSTI; NTIS (US Sales Only); INIS		DE94602763	
716	19:675	OSTI; NTIS (US Sales Only); INIS		DE94603246	
IAEA/PI–					
A22E.	19:2810	*See* INIS-mf–13711			
IAEA/UNDP–					
INS/88/013-12	19:2171	OSTI; NTIS (US Sales Only); INIS		DE94604398	
IFSR–					
602	19:2634	*See* DOE/ET/53088–602			
614	19:2635	*See* DOE/ET/53088–614			
621	19:2636	*See* DOE/ET/53088–621			
623	19:2637	*See* DOE/ET/53088–623			
626	19:2739	*See* DOE/ET/53088–626			
IFVE-OMVT–					
92-119	19:2282	OSTI; NTIS (US Sales Only); INIS		DE94606292	
IFVE-ONF–					
92-140	19:1618	OSTI; NTIS (US Sales Only); INIS		DE94606062	
IGC–					
128	19:1432	OSTI; NTIS (US Sales Only); INIS		DE94605857	
IHEP-OTF–					
92-85	19:2283	OSTI; NTIS (US Sales Only); INIS		DE94606293	
92-96	19:2284	OSTI; NTIS (US Sales Only); INIS		DE94606294	
INIS-BR–					
3148	19:2142	OSTI; NTIS (US Sales Only); INIS		DE94604139	
3153	19:1166	OSTI; NTIS (US Sales Only); INIS		DE94604076	
3165	19:1167	OSTI; NTIS (US Sales Only); INIS		DE94604020	
3166	19:1168	OSTI; NTIS (US Sales Only); INIS		DE94604021	
3167	19:1169	OSTI; NTIS (US Sales Only); INIS		DE94604077	
3168	19:1170	OSTI; NTIS (US Sales Only); INIS		DE94604078	
3169	19:1171	OSTI; NTIS (US Sales Only); INIS		DE94604079	
3170	19:1172	OSTI; NTIS (US Sales Only); INIS		DE94604080	
3171	19:1173	OSTI; NTIS (US Sales Only); INIS		DE94604081	
3172	19:2173	OSTI; NTIS (US Sales Only); INIS		DE94605591	
3173	19:2006	OSTI; NTIS (US Sales Only); INIS		DE94604289	
3174	19:2418	OSTI; NTIS (US Sales Only); INIS		DE94604022	
3175	19:2007	OSTI; NTIS (US Sales Only); INIS		DE94604284	
3176	19:2008	OSTI; NTIS (US Sales Only); INIS		DE94604290	
3177	19:1175	OSTI; NTIS (US Sales Only); INIS		DE94604023	
3178	19:1176	OSTI; NTIS (US Sales Only); INIS		DE94604024	
3179	19:1177	OSTI; NTIS (US Sales Only); INIS		DE94604025	
3180	19:1178	OSTI; NTIS (US Sales Only); INIS		DE94604026	
3181	19:1179	OSTI; NTIS (US Sales Only); INIS		DE94604027	
3182	19:1180	OSTI; NTIS (US Sales Only); INIS		DE94604028	
3183	19:2009	OSTI; NTIS (US Sales Only); INIS		DE94604291	
3184	19:1181	OSTI; NTIS (US Sales Only); INIS		DE94604029	
3185	19:2010	OSTI; NTIS (US Sales Only); INIS		DE94604285	
3186	19:2011	OSTI; NTIS (US Sales Only); INIS		DE94604292	
3187	19:1182	OSTI; NTIS (US Sales Only); INIS		DE94605094	
3188	19:1183	OSTI; NTIS (US Sales Only); INIS		DE94604030	
3189	19:1184	OSTI; NTIS (US Sales Only); INIS		DE94605095	
3190	19:1185	OSTI; NTIS (US Sales Only); INIS		DE94604031	
3191	19:1186	OSTI; NTIS (US Sales Only); INIS		DE94604032	
3192	19:1187	OSTI; NTIS (US Sales Only); INIS		DE94604033	
3193	19:1188	OSTI; NTIS (US Sales Only); INIS		DE94604034	
3194	19:1189	OSTI; NTIS (US Sales Only); INIS		DE94604035	
3195	19:1190	OSTI; NTIS (US Sales Only); INIS		DE94604036	
3196	19:1191	OSTI; NTIS (US Sales Only); INIS		DE94604037	
3197	19:1192	OSTI; NTIS (US Sales Only); INIS		DE94604038	
3198	19:1193	OSTI; NTIS (US Sales Only); INIS		DE94604039	
3199	19:1194	OSTI; NTIS (US Sales Only); INIS		DE94604040	
3200	19:1195	OSTI; NTIS (US Sales Only); INIS		DE94604041	
3201	19:2012	OSTI; NTIS (US Sales Only); INIS		DE94605473	
3202	19:2110	OSTI; NTIS (US Sales Only); INIS		DE94604314	
INIS-GB–					
494	19:513	OSTI; NTIS (US Sales Only); INIS		DE94604432	
501	19:2806	OSTI; NTIS (US Sales Only); INIS		DE94604703	
502	19:2807	OSTI; NTIS (US Sales Only); INIS		DE94604704	
504	19:2808	OSTI; NTIS (US Sales Only); INIS		DE94604705	
505	19:269	OSTI; NTIS (US Sales Only); INIS		DE94606151	
506	19:2809	OSTI; NTIS (US Sales Only); INIS		DE94606282	

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INIS-RU–					
343	19:2420	OSTI; NTIS (US Sales Only); INIS		DE93626131	
INIS-SU–					
321/A	19:2329	OSTI; NTIS (US Sales Only); INIS		DE93609886	
327/A	19:2279	OSTI; NTIS (US Sales Only); INIS		DE93615286	
338	19:2280	OSTI; NTIS (US Sales Only); INIS		DE93616653	
340/A	19:2521	OSTI; NTIS (US Sales Only); INIS		DE93620575	
341/A	19:2421	OSTI; NTIS (US Sales Only); INIS		DE93620974	
342/A	19:1010	OSTI; NTIS (US Sales Only); INIS		DE93620498	
INIS-UA–					
0001	19:2482	OSTI; NTIS (US Sales Only); INIS		DE94604545	
INIS-mf–					
13386	19:165	OSTI; NTIS (US Sales Only); INIS		DE93608776	
13387	19:166	OSTI; NTIS (US Sales Only); INIS		DE93608801	
13388	19:2419	OSTI; NTIS (US Sales Only); INIS		DE93612972	
13442	19:1146	OSTI; NTIS (US Sales Only); INIS		DE93616001	
13516	19:726	OSTI; NTIS (US Sales Only); INIS		DE93623250	
13522	19:783	OSTI; NTIS (US Sales Only); INIS		DE93624533	
13584	19:2755	OSTI; NTIS (US Sales Only); INIS		DE94603958	
13632	19:270	OSTI; NTIS (US Sales Only); INIS		DE94603559	
13711	19:2810	OSTI; NTIS (US Sales Only); INIS		DE94604706	
13712	19:727	OSTI; NTIS (US Sales Only); INIS		DE94604674	
13713	19:676	OSTI; NTIS (US Sales Only); INIS		DE94604584	
13714	19:2651	OSTI; NTIS (US Sales Only); INIS		DE94604181	
13715	19:2811	OSTI; NTIS (US Sales Only); INIS		DE94606283	
13716	19:2812	OSTI; NTIS (US Sales Only); INIS		DE94604707	
13717	19:1297	OSTI; NTIS (US Sales Only); INIS		DE94605258	
13718	19:1251	OSTI; NTIS (US Sales Only); INIS		DE94605138	
13719	19:2174	OSTI; NTIS (US Sales Only); INIS		DE94604393	
13720	19:2213	OSTI; NTIS (US Sales Only); INIS		DE94604340	
13721	19:1639	OSTI; NTIS (US Sales Only); INIS		DE94606011	
13723	19:1424	OSTI; NTIS (US Sales Only); INIS		DE94604534	
13724	19:2686	OSTI; NTIS (US Sales Only); INIS		DE94604986	
13725	19:1008	OSTI; NTIS (US Sales Only); INIS		DE94605318	
13727	19:2892	OSTI; NTIS (US Sales Only); INIS		DE94604693	
13728	19:2893	OSTI; NTIS (US Sales Only); INIS		DE94604694	
13729	19:488	OSTI; NTIS (US Sales Only); INIS		DE94604691	
13730	19:1196	OSTI; NTIS (US Sales Only); INIS		DE94604042	
13731	19:1640	OSTI; NTIS (US Sales Only); INIS		DE94604043	
14150	19:1009	OSTI; NTIS (US Sales Only); INIS		DE93796949	
INP-MSU–					
92-17-266	19:2335	OSTI; NTIS (US Sales Only); INIS		DE94606337	
92-33-282	19:2287	OSTI; NTIS (US Sales Only); INIS		DE94606295	
92-37-286	19:2359	OSTI; NTIS (US Sales Only); INIS		DE94606441	
INS–					
976	19:2493	OSTI; NTIS; INIS		DE94718996	
983	19:2429	OSTI; NTIS; INIS		DE94718991	
985	19:2430	OSTI; NTIS; INIS		DE94718990	
986	19:2431	OSTI; NTIS; INIS		DE94718989	
988	19:2494	OSTI; NTIS; INIS		DE94718988	
IPPCZ–					
321	19:2756	OSTI; NTIS (US Sales Only); INIS		DE93619992	
IR-CR–					
93075	19:2058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000434	
93076	19:2059	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040730	
93077	19:2060	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000501	
93078	19:2061	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000530	
93079	19:2062	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000522	
93080	19:2063	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000562	
93081	19:2064	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000500	
93082	19:2065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000584	
93086	19:2066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000992	
93087	19:2067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001662	
93088	19:2068	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001663	
IS–					
5092	19:25	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001722	PC-114
5098	19:2069	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000668	MF-400
IS-M–					
753	19:1088	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041127	MF-404
760	19:1	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000667	MF-102
761	19:1011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000666	MF-411

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
762	19:1012	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000665	MF-404
763	19:1123	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000692	MF-404
764	19:26	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000693	MF-102
765	19:1013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000694	MF-413
766	19:1089	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000696	MF-404
767	19:876	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000695	MF-404
768	19:1124	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000697	MF-404
771	19:1090	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001192	MF-404
772	19:1433	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001193	MF-404
774	19:2070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001805	MF-902
IS-T–					
1645	19:1252	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041126	MF-401
1665	19:1091	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041123	MF-401
ISO–					
100	19:271	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93019700	MF-510
ITRI–					
141	19:792	*See* NUREG/CR–4214-Rev.2-Pt.1			
IVL-B–					
1105	19:1940	OSTI; NTIS		DE94709804	
JAB–					
10733-2	19:1860	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001092	MF-702
JAERI-M–					
93-061	19:220	OSTI; NTIS; INIS		DE94718955	
93-068	19:771	OSTI; NTIS; INIS		DE94718754	
93-078	19:735	OSTI; NTIS; INIS		DE94718641	
93-096	19:679	OSTI; NTIS; INIS		DE94718756	
93-097	19:714	OSTI; NTIS; INIS		DE94718752	
93-103	19:744	OSTI; NTIS; INIS		DE94718743	
93-104	19:745	OSTI; NTIS; INIS		DE94718748	
93-106	19:680	OSTI; NTIS; INIS		DE94718750	
93-115	19:1769	OSTI; NTIS; INIS		DE94718745	
93-118	19:1941	OSTI; NTIS; INIS		DE94718956	
93-122	19:746	OSTI; NTIS; INIS		DE94718740	
93-123	19:2757	OSTI; NTIS; INIS		DE94718957	
93-124	19:2495	OSTI; NTIS; INIS		DE94718958	
93-125	19:2071	OSTI; NTIS; INIS		DE94718959	
93-127	19:221	OSTI; NTIS; INIS		DE94718960	
93-130	19:2758	OSTI; NTIS; INIS		DE94718961	
93-132	19:2759	OSTI; NTIS; INIS		DE94718962	
93-135	19:2522	OSTI; NTIS; INIS		DE94719023	
93-141	19:2760	OSTI; NTIS; INIS		DE94718963	
93-143	19:2523	OSTI; NTIS; INIS		DE94718964	
93-144	19:1014	OSTI; NTIS; INIS		DE94718965	
93-145	19:2761	OSTI; NTIS; INIS		DE94718966	
93-150	19:1015	OSTI; NTIS; INIS		DE94719014	
93-152	19:2594	OSTI; NTIS; INIS		DE94719024	
93-174	19:1465	OSTI; NTIS; INIS		DE94719028	
JINR–					
1-47-91	19:2422	OSTI; NTIS (US Sales Only); INIS		DE93616535	
13-92-121	19:1770	OSTI; NTIS (US Sales Only); INIS		DE94606021	
15-92-375	19:2690	OSTI; NTIS (US Sales Only); INIS		DE94606807	
18-92-180	19:1771	OSTI; NTIS (US Sales Only); INIS		DE94606117	
18-92-303	19:272	OSTI; NTIS (US Sales Only); INIS		DE94606145	
5-51-91	19:2423	OSTI; NTIS (US Sales Only); INIS		DE93626358	
7-46-90	19:2424	OSTI; NTIS (US Sales Only); INIS		DE93609511	
92-169	19:2813	OSTI; NTIS (US Sales Only); INIS		DE94606284	
JINR-D–					
1-92-534	19:2409	OSTI; NTIS (US Sales Only); INIS		DE94606491	
15-92-323	19:2691	OSTI; NTIS (US Sales Only); INIS		DE94606806	
15-92-324	19:2496	OSTI; NTIS (US Sales Only); INIS		DE94606567	
15-92-327	19:2559	OSTI; NTIS (US Sales Only); INIS		DE94606751	
2-92-114	19:2338	OSTI; NTIS (US Sales Only); INIS		DE94606328	
2-92-147	19:2288	OSTI; NTIS (US Sales Only); INIS		DE94606296	
2-92-159	19:2306	OSTI; NTIS (US Sales Only); INIS		DE94606324	
2-92-196	19:2307	OSTI; NTIS (US Sales Only); INIS		DE94606325	
2-92-63	19:2336	OSTI; NTIS (US Sales Only); INIS		DE94606338	
2-92-70	19:2337	OSTI; NTIS (US Sales Only); INIS		DE94606329	
JINR-E–					
1-92-256	19:2497	OSTI; NTIS (US Sales Only); INIS		DE94606568	
1-92-307	19:2498	OSTI; NTIS (US Sales Only); INIS		DE94606569	
1-92-333	19:1772	OSTI; NTIS (US Sales Only); INIS		DE94606063	

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1-92-414	19:1773	OSTI; NTIS (US Sales Only); INIS		DE94606064	
1-92-518	19:1253	OSTI; NTIS (US Sales Only); INIS		DE94605139	
1-93-115	19:1774	OSTI; NTIS (US Sales Only); INIS		DE94606065	
1-93-51	19:2499	OSTI; NTIS (US Sales Only); INIS		DE94606589	
10-92-352	19:1775	OSTI; NTIS (US Sales Only); INIS		DE94606066	
10-93-86	19:1776	OSTI; NTIS (US Sales Only); INIS		DE94606067	
11-92-357	19:2294	OSTI; NTIS (US Sales Only); INIS		DE94606297	
12-92-390	19:1539	OSTI; NTIS (US Sales Only); INIS		DE94605841	
13-92-219	19:1778	OSTI; NTIS (US Sales Only); INIS		DE94606068	
13-92-52	19:1777	OSTI; NTIS (US Sales Only); INIS		DE94606069	
13-92-545	19:1779	OSTI; NTIS (US Sales Only); INIS		DE94606070	
14-92-184	19:1214	OSTI; NTIS (US Sales Only); INIS		DE94605096	
15-93-96	19:2453	OSTI; NTIS (US Sales Only); INIS		DE94606549	
17-92-348	19:2613	OSTI; NTIS (US Sales Only); INIS		DE94606935	
17-92-412	19:2345	OSTI; NTIS (US Sales Only); INIS		DE94606382	
2-92-106	19:2390	OSTI; NTIS (US Sales Only); INIS		DE94606481	
2-92-132	19:2308	OSTI; NTIS (US Sales Only); INIS		DE94606326	
2-92-136	19:2360	OSTI; NTIS (US Sales Only); INIS		DE94606405	
2-92-160	19:2289	OSTI; NTIS (US Sales Only); INIS		DE94606298	
2-92-173	19:2361	OSTI; NTIS (US Sales Only); INIS		DE94606413	
2-92-320	19:2500	OSTI; NTIS (US Sales Only); INIS		DE94606570	
2-92-337	19:2339	OSTI; NTIS (US Sales Only); INIS		DE94606339	
2-92-361	19:2362	OSTI; NTIS (US Sales Only); INIS		DE94606414	
2-92-368	19:2391	OSTI; NTIS (US Sales Only); INIS		DE94606457	
2-92-377	19:2340	OSTI; NTIS (US Sales Only); INIS		DE94606340	
2-92-388	19:2363	OSTI; NTIS (US Sales Only); INIS		DE94606442	
2-92-411	19:2341	OSTI; NTIS (US Sales Only); INIS		DE94606383	
2-92-424	19:2501	OSTI; NTIS (US Sales Only); INIS		DE94606565	
2-92-440	19:2290	OSTI; NTIS (US Sales Only); INIS		DE94606299	
2-92-479	19:2342	OSTI; NTIS (US Sales Only); INIS		DE94606330	
2-92-497	19:2343	OSTI; NTIS (US Sales Only); INIS		DE94606341	
2-92-506	19:2291	OSTI; NTIS (US Sales Only); INIS		DE94606300	
2-92-547	19:2410	OSTI; NTIS (US Sales Only); INIS		DE94606495	
2-93-9	19:2502	OSTI; NTIS (US Sales Only); INIS		DE94606571	
2-93-118	19:2366	OSTI; NTIS (US Sales Only); INIS		DE94606415	
2-93-16	19:2503	OSTI; NTIS (US Sales Only); INIS		DE94606590	
2-93-25	19:2364	OSTI; NTIS (US Sales Only); INIS		DE94606406	
2-93-41	19:2432	OSTI; NTIS (US Sales Only); INIS		DE94606503	
2-93-56	19:2365	OSTI; NTIS (US Sales Only); INIS		DE94606407	
2-93-88	19:2392	OSTI; NTIS (US Sales Only); INIS		DE94606458	
3-92-417	19:2393	OSTI; NTIS (US Sales Only); INIS		DE94606459	
3-92-465	19:2504	OSTI; NTIS (US Sales Only); INIS		DE94606572	
4-92-138	19:2505	OSTI; NTIS (US Sales Only); INIS		DE94606591	
4-92-183	19:2443	OSTI; NTIS (US Sales Only); INIS		DE94606545	
4-92-358	19:2560	OSTI; NTIS (US Sales Only); INIS		DE94606752	
4-93-94	19:2292	OSTI; NTIS (US Sales Only); INIS		DE94606301	
5-92-202	19:2293	OSTI; NTIS (US Sales Only); INIS		DE94606302	
5-92-395	19:2344	OSTI; NTIS (US Sales Only); INIS		DE94606342	
9-92-406	19:1537	OSTI; NTIS (US Sales Only); INIS		DE94605842	
9-92-459	19:1538	OSTI; NTIS (US Sales Only); INIS		DE94605837	
9-93-68	19:1592	OSTI; NTIS (US Sales Only); INIS		DE94605856	
JINR-R–					
1-92-131	19:2394	OSTI; NTIS (US Sales Only); INIS		DE94606473	
1-92-193	19:2506	OSTI; NTIS (US Sales Only); INIS		DE94606573	
1-92-262	19:2507	OSTI; NTIS (US Sales Only); INIS		DE94606561	
1-92-376	19:1780	OSTI; NTIS (US Sales Only); INIS		DE94606071	
1-92-512	19:2508	OSTI; NTIS (US Sales Only); INIS		DE94606574	
1-92-525	19:1781	OSTI; NTIS (US Sales Only); INIS		DE94606072	
1-93-64	19:2411	OSTI; NTIS (US Sales Only); INIS		DE94606496	
10-92-156	19:1785	OSTI; NTIS (US Sales Only); INIS		DE94606073	
10-92-188	19:1824	OSTI; NTIS (US Sales Only); INIS		DE94606138	
10-92-214	19:2511	OSTI; NTIS (US Sales Only); INIS		DE94606605	
10-92-317	19:2854	OSTI; NTIS (US Sales Only); INIS		DE94606266	
10-92-369	19:2412	OSTI; NTIS (US Sales Only); INIS		DE94606497	
10-92-370	19:2855	OSTI; NTIS (US Sales Only); INIS		DE94606267	
10-92-386	19:2856	OSTI; NTIS (US Sales Only); INIS		DE94606139	
10-93-15	19:2857	OSTI; NTIS (US Sales Only); INIS		DE94606268	
10-93-40	19:2858	OSTI; NTIS (US Sales Only); INIS		DE94606271	
11-92-142	19:2346	OSTI; NTIS (US Sales Only); INIS		DE94606343	
11-92-164	19:2859	OSTI; NTIS (US Sales Only); INIS		DE94606272	
11-92-509	19:1541	OSTI; NTIS (US Sales Only); INIS		DE94605843	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
13-92-200	19:1786	OSTI; NTIS (US Sales Only); INIS		DE94606074	
13-92-215	19:1787	OSTI; NTIS (US Sales Only); INIS		DE94606075	
13-92-216	19:1788	OSTI; NTIS (US Sales Only); INIS		DE94606076	
13-92-331	19:1789	OSTI; NTIS (US Sales Only); INIS		DE94606017	
13-92-347	19:1790	OSTI; NTIS (US Sales Only); INIS		DE94606077	
13-92-513	19:1791	OSTI; NTIS (US Sales Only); INIS		DE94606078	
13-92-524	19:1792	OSTI; NTIS (US Sales Only); INIS		DE94606116	
13-92-526	19:1793	OSTI; NTIS (US Sales Only); INIS		DE94606079	
13-93-95	19:731	OSTI; NTIS (US Sales Only); INIS		DE94605883	
14-92-396	19:2595	OSTI; NTIS (US Sales Only); INIS		DE94606885	
14-92-400	19:2577	OSTI; NTIS (US Sales Only); INIS		DE94606850	
14-92-401	19:2578	OSTI; NTIS (US Sales Only); INIS		DE94606851	
14-92-579	19:2579	OSTI; NTIS (US Sales Only); INIS		DE94606852	
15-93-29	19:2413	OSTI; NTIS (US Sales Only); INIS		DE94606492	
16-93-37	19:2224	OSTI; NTIS (US Sales Only); INIS		DE94605624	
17-92-402	19:2580	OSTI; NTIS (US Sales Only); INIS		DE94606853	
2-92-151	19:2395	OSTI; NTIS (US Sales Only); INIS		DE94606460	
2-92-66	19:2295	OSTI; NTIS (US Sales Only); INIS		DE94606303	
2-93-44	19:2396	OSTI; NTIS (US Sales Only); INIS		DE94606446	
3-92-186	19:2524	OSTI; NTIS (US Sales Only); INIS		DE94606662	
3-92-325	19:1782	OSTI; NTIS (US Sales Only); INIS		DE94606018	
3-92-346	19:1783	OSTI; NTIS (US Sales Only); INIS		DE94606019	
3-92-350	19:1540	OSTI; NTIS (US Sales Only); INIS		DE94605844	
3-93-11	19:2509	OSTI; NTIS (US Sales Only); INIS		DE94606592	
4-92-297	19:2853	OSTI; NTIS (US Sales Only); INIS		DE94606269	
4-92-389	19:2296	OSTI; NTIS (US Sales Only); INIS		DE94606304	
4-92-471	19:2525	OSTI; NTIS (US Sales Only); INIS		DE94606663	
4-93-148	19:2433	OSTI; NTIS (US Sales Only); INIS		DE94606533	
6-92-148	19:1784	OSTI; NTIS (US Sales Only); INIS		DE94606020	
6-92-397	19:1300	OSTI; NTIS (US Sales Only); INIS		DE94605260	
7-92-360	19:2510	OSTI; NTIS (US Sales Only); INIS		DE94606594	
8-92-238	19:2301	OSTI; NTIS (US Sales Only); INIS		DE94606322	
9-92-296	19:1466	OSTI; NTIS (US Sales Only); INIS		DE94605817	
9-92-309	19:1493	OSTI; NTIS (US Sales Only); INIS		DE94605823	
9-93-81	19:1494	OSTI; NTIS (US Sales Only); INIS		DE94605824	
9-93-82	19:1495	OSTI; NTIS (US Sales Only); INIS		DE94605825	
K/CSD/TM–					
93-Rev.2	19:1369	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001548	MF-905
KAPL–					
4759	19:1016	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040438	PC-504
4760	19:1017	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001578	PC-504
KCL-RAINA–					
7	19:938	OSTI; NTIS		DE94709714	
8	19:939	OSTI; NTIS		DE94709715	
9	19:940	OSTI; NTIS		DE94709716	
10	19:941	OSTI; NTIS		DE94709717	
11	19:942	OSTI; NTIS		DE94709718	
12	19:943	OSTI; NTIS		DE94709719	
13	19:944	OSTI; NTIS		DE94709720	
14	19:945	OSTI; NTIS		DE94709721	
KCP–					
613-5077	19:1861	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040854	PC-706
613-5153	19:1794	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001374	MF-706
613-5171	19:2072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000362	PC-702
613-5215	19:1862	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001373	MF-706
613-5216	19:946	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001378	MF-706
613-5218	19:1863	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001169	MF-706
613-5230	19:1434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001361	MF-704
613-5255	19:1018	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001377	MF-706
KIYal–					
92-12	19:784	OSTI; NTIS (US Sales Only); INIS		DE93623464	
KTH-KTR–					
93-07	19:974	OSTI; NTIS		DE94709808	
KTM/E-B–					
147	19:273	OSTI; NTIS; INIS		DE94606152	
166	19:947	OSTI; NTIS		DE94709702	
KY/ER–					
11	19:430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000599	MF-902
LA–					
12168-MS	19:1877	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001573	PC-700; PC-900

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
12169-MS	19:1878	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001851	PC-700; PC-900
12296-MS	19:1833	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001571	PC-700
12297-MS	19:1879	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001572	PC-700
12300-MS	19:1880	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001077	PC-700
12371-MS	19:184	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001008	MF-706; MF-721
12542-MS	19:274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000698	MF-814
12585	19:1215	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001162	MF-701
12586-PR	19:1942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000542	MF-902; MF-940
12597-MS	19:1216	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001834	MF-700
12601-MS	19:2309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001683	MF-910
12606-MS	19:596	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001568	MF-251
12627-MS	19:476	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002434	MF-700
12647-PR	19:2581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001885	MF-410; MF-404
12650-MS	19:2073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002499	MF-940
12653-PR	19:510	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002019	MF-500
12659-MS	19:732	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001891	MF-714
12662-MS	19:2225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001161	MF-714
12667-MS	19:275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001837	MF-940
12673-C	19:1125	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE93041117	MF-700
12682-PR	19:511	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002020	MF-500
LA-SUB–					
93-231	19:1943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040570	MF-802
93-236	19:2860	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002567	
93-274(10/91)	19:93	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040582	MF-702
93-274(5/91)	19:92	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040581	MF-702
93-275	19:2540	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040564	MF-411
93-282	19:1442	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040560	MF-701
93-292	19:1443	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001472	
93-299	19:1842	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002570	MF-741
93-304	19:2762	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001471	
93-311	19:1834	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002565	
LA-UR–					
89-2675-Vol.1	19:2763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040030	MF-712
89-2675-Vol.2	19:2764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040031	MF-712
90-1423	19:1864	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002621	
92-244	19:1873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040671	MF-703
92-2577	19:277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000628	MF-814
92-310	19:2260	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040507	MF-703
92-3393	19:1874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040817	MF-700
93-1884	19:1875	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040508	MF-703
93-1914	19:278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93014459	MF-940
93-2201	19:1944	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018562	MF-702
93-2343	19:1843	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018340	MF-741
93-2344	19:1844	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018339	MF-741
93-2579	19:279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018552	MF-940
93-2609	19:477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018539	MF-700
93-2660	19:1217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040194	MF-804
93-2686	19:1019	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018297	MF-704
93-2790	19:2596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040263	MF-700
93-2821	19:1092	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040261	MF-901
93-2827	19:2137	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040260	
93-2870	19:2765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040250	MF-414; MF-424
93-2879	19:1093	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040248	MF-410; MF-404
93-2879	19:1102	*See* SAND–93-1979C			
93-2888	19:2532	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040064	MF-904
93-2895	19:280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000812	MF-940
93-2896	19:281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000811	MF-721
93-2901	19:2157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000810	MF-910
93-2904	19:1845	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000809	MF-741
93-2919	19:1020	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040061	MF-901; MF-906
93-2928	19:2434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040099	MF-413
93-2936	19:2131	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040096	MF-401
93-2941	19:1593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040095	MF-414
93-2942	19:1094	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040094	MF-704

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-2944	19:282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040092	MF-940
93-2949	19:2512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040107	MF-910; MF-904
93-2950	19:2302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040106	MF-700
93-2951	19:2766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040105	MF-910; MF-904
93-2972	19:478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040123	MF-700
93-2983	19:2158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040124	MF-408
93-2986	19:2176	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040125	MF-905; MF-908
93-2990	19:507	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040126	
93-3006	19:2397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040127	MF-413
93-3007	19:757	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040128	MF-702
93-3008	19:826	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040129	MF-702
93-3013	19:2132	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040130	MF-908
93-3021	19:1795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040132	MF-906
93-3060	19:1095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040190	MF-743
93-3072	19:2861	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040188	MF-700
93-3103	19:1865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040142	MF-700; MF-701
93-3115	19:1021	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040144	MF-704
93-3124	19:2310	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040146	
93-3127	19:1075	*See* ANL/MSD/CP–80681			
93-3134	19:604	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040148	MF-252
93-3138	19:2862	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040150	MF-405
93-3140	19:2863	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040152	MF-405
93-3143	19:1022	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000807	MF-704
93-3144	19:1096	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000806	MF-904; MF-906
93-3155	19:1023	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040153	MF-404
93-3184	19:2563	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040159	MF-372
93-3189	19:1097	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040161	MF-704
93-3216	19:1024	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000805	MF-700
93-3227	19:2367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000804	MF-414
93-3236	19:2513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000801	MF-700
93-3237	19:1444	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000800	MF-706
93-3241	19:2608	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000799	MF-705
93-3249	19:1025	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000796	MF-904
93-3254	19:1542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000795	MF-700
93-3268	19:1218	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000777	MF-404
93-3271	19:2330	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000776	MF-900
93-3291	19:283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000898	MF-721
93-3304	19:1026	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000895	MF-701
93-3306	19:2245	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000894	MF-707
93-3320	19:1543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000892	
93-3321	19:1544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000891	
93-3324	19:719	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000889	MF-528
93-3329	19:2609	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000887	MF-700
93-3330	19:2261	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000775	MF-402; MF-405
93-3333	19:1254	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000774	MF-704
93-3334	19:2514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000794	MF-411
93-3350	19:1027	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000793	MF-404
93-3353	19:2262	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000772	MF-903; MF-908
93-3361	19:720	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000769	MF-528
93-3377	19:2435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000766	MF-700
93-3378	19:2436	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000765	MF-700
93-3389	19:1381	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000763	MF-706
93-3390	19:2311	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000762	MF-706
93-3391	19:986	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000761	MF-904
93-3396	19:2767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000823	MF-420
93-3404	19:284	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000821	MF-704
93-3406	19:1889	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000819	MF-702
93-3419	19:1945	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000817	
93-3426	19:2555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000884	MF-700
93-3429	19:2515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000825	MF-413
93-3432	19:1382	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000707	MF-706
93-3433	19:1435	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000706	MF-704
93-3437	19:1946	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000704	MF-902
93-3440	19:278	*See* LA-UR–93-1914			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-3448	19:2526	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000701	MF-700
93-3449	19:1028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000700	MF-406; MF-414
93-3452	19:2768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000699	MF-700
93-3453	19:1029	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000690	
93-3454	19:1030	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000689	MF-704
93-3464	19:1301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000684	MF-401; MF-404
93-3466	19:1383	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000683	MF-906
93-3469	19:1477	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000681	
93-3473	19:1031	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000680	MF-406
93-3488	19:2312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000677	MF-412
93-3490	19:2437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000674	MF-413
93-3496	19:2347	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000675	MF-700
93-3502	19:2692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000673	MF-424
93-3504	19:1032	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000672	MF-704
93-3516	19:2348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000671	MF-413
93-3518	19:1384	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000670	MF-743
93-3529	19:1545	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000669	
93-3532	19:1478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002631	MF-414
93-3648	19:2769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002711	MF-424
93-3677	19:2770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002720	MF-424
93-3715	19:1385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002696	
93-3717	19:285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002694	MF-940
93-3724	19:1546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002692	MF-910
93-3800	19:286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002724	MF-940
93-3811	19:1808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002705	MF-906
LAL–					
93-02	19:2444	OSTI; NTIS (US Sales Only); INIS		DE94604896	
LALP–					
93-54	19:276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001860	MF-721
LBL–					
33237	19:1594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001260	MF-410
33290-Rev.	19:1547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040636	MF-414
33341	19:1595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001258	MF-410
33355	19:1496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001259	MF-410
33432	19:1497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002274	MF-414
33514	19:1033	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001250	MF-404
33677	19:2414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001726	MF-414
33727	19:605	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001257	MF-250
33745	19:2138	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040643	MF-408
33786	19:1034	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019235	MF-404
34015	19:1445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001261	MF-414
34031	19:1481	*See* SLAC-PUB–6150			
34101	19:906	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000729	MF-920
34107	19:2771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040299	MF-419
34127	19:2164	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040644	MF-408
34223	19:907	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000570	MF-350
34232	19:2415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040637	MF-414
34238	19:1548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040302	MF-410
34242	19:597	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001253	MF-250
34253	19:1549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002266	PC-414
34254	19:2772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002265	PC-421
34278	19:1126	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040122	MF-404
34280	19:1127	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040120	MF-404
34384	19:2864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001254	MF-414
34395	19:1128	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040300	MF-404
34410	19:1255	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040297	MF-311
34412	19:859	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000727	MF-920
34415	19:2773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040288	MF-414
34461	19:2074	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001256	MF-403
34481	19:1277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000568	MF-401
34523	19:1098	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040640	MF-404
34541	19:1796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002308	MF-411
34547	19:1550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001252	MF-410
34553	19:79	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040668	MF-403
34569	19:2226	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000569	MF-401
34575	19:2313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040926	MF-414
34661	19:1302	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002273	MF-401
LRAP–					
127	19:2541	OSTI; NTIS; INIS		DE94606679	

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LRAP–					
128	19:2542	OSTI; NTIS; INIS		DE94606680	
134	19:2533	OSTI; NTIS; INIS		DE94606673	
135	19:2543	OSTI; NTIS; INIS		DE94606681	
137	19:1825	OSTI; NTIS; INIS		DE94606140	
LRP–					
462/92	19:2693	OSTI; NTIS (US Sales Only); INIS		DE93614568	
LSGN–					
124-Rev.	19:1547	*See* LBL–33290-Rev.			
LUFTD2-TFFF–					
0038-1-155	19:1129	OSTI; NTIS; INIS		DE94605430	
LUTMDN-TMKT–					
93-5143	19:948	OSTI; NTIS		DE94709809	
LUTMDN-TMVK–					
3156	19:955	OSTI; NTIS		DE94709792	
3158	19:956	OSTI; NTIS		DE94709793	
3159	19:969	OSTI; NTIS		DE94709794	
7012	19:970	OSTI; NTIS		DE94709795	
LUTVDG-TVBH–					
3018-1-41	19:908	OSTI; NTIS		DE94709810	
MLM–					
3786	19:512	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002875	PC-713
MSHA/IR–					
1154	19:2246	OSTI; NTIS		DE94001244	
1208	19:2247	OSTI; NTIS		DE94001245	
1210	19:163	OSTI; NTIS		DE94001247	
1211	19:2248	OSTI; NTIS		DE94001243	
MTCI–					
10039-13	19:13	*See* DOE/MC/26367–3463			
MTL-TR–					
89-21	19:1084	*See* DOE/OR/21411–T2			
NASA-CR–					
191189	19:966	*See* DOE/NASA–1087-2			
NASA/CR–					
191088	19:965	*See* DOE/NASA/0335–5			
NEDO-C–					
9202	19:63	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714906	
9204	19:37	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714916	
NEDO-GET–					
9201	19:828	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714881	
9202	19:829	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714882	
9204	19:830	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714883	
9205	19:831	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714884	
9207	19:27	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714885	
9208	19:574	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714886	
9209	19:832	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714887	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
9210-1	19:833	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714888	
9210-2	19:575	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714889	
9210-5	19:834	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714890	
9211	19:2075	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714899	
9213	19:835	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714891	
NEDO-ITE–					
9110-6	19:836	OSTI; NTIS; Available from New Energy and Industrial Technogy Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714880	
NEDO-P–					
9176	19:576	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714892	
9177	19:851	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714893	
9178	19:852	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714894	
9179	19:853	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714895	
9180	19:823	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714896	
9203	19:872	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714897	
9210	19:669	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714898	
9215	19:949	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714900	
9218	19:577	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714901	
9219	19:873	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714902	
9220	19:950	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714903	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
NEDO-P–					
9221	19:38	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714904	
9257	19:854	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE94714905	
NEI-DK–					
1281	19:1425	OSTI; NTIS; INIS		DE94605805	
NEI-NO–					
361	19:2398	OSTI; NTIS; INIS		DE94606447	
NEI-SE–					
127	19:670	OSTI; NTIS		DE94709803	
133	19:837	OSTI; NTIS		DE94709811	
134	19:838	OSTI; NTIS		DE94709812	
136	19:811	OSTI; NTIS; INIS		DE94709807	
NESC–					
9902	19:2848	*See* ESTSC/NRC–000096I303300			
NHP–					
32	19:2263	OSTI; NTIS		DE94709722	
NIFS–					
167	19:2694	OSTI; NTIS; INIS		DE94718974	
170	19:2695	OSTI; NTIS; INIS		DE94718983	
176	19:2696	OSTI; NTIS; INIS		DE94718976	
177	19:2774	OSTI; NTIS; INIS		DE94718975	
179	19:2697	OSTI; NTIS; INIS		DE94718980	
180	19:2775	OSTI; NTIS; INIS		DE94718979	
181	19:2698	OSTI; NTIS; INIS		DE94718978	
184	19:2699	OSTI; NTIS; INIS		DE94718982	
185	19:2700	OSTI; NTIS; INIS		DE94718981	
186	19:2776	OSTI; NTIS; INIS		DE94718985	
187	19:2701	OSTI; NTIS; INIS		DE94718986	
198	19:2702	OSTI; NTIS; INIS		DE94718984	
215	19:2703	OSTI; NTIS; INIS		DE94718993	
216	19:2704	OSTI; NTIS; INIS		DE94718992	
217	19:2705	OSTI; NTIS; INIS		DE94718995	
220	19:2706	OSTI; NTIS; INIS		DE94718994	
NIFS-MEMO–					
9	19:2707	OSTI; NTIS; INIS		DE94718910	
NIIEFA-P–					
0908	19:2777	OSTI; NTIS (US Sales Only); INIS		DE94606817	
NIIYaF-MGU–					
92-17-266.	19:2335	*See* INP-MSU–92-17-266			
92-33-282.	19:2287	*See* INP-MSU–92-33-282			
92-37-286.	19:2359	*See* INP-MSU–92-37-286			
NILU-OR–					
67/92	19:1952	OSTI; NTIS		DE94709728	
NILU/OR–					
87/92	19:2227	OSTI; NTIS; INIS		DE94605625	
NIPER–					
717	19:80	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000531	MF-122; MF-125
NIRS-M–					
92	19:2111	OSTI; NTIS; INIS		DE94719027	
NISTIR–					
5268	19:809	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001839	
NNC-EDC–					
91/94.	19:248	*See* DOE-HMIP-RR–92.12			
NREL/CP–					
320-5717	19:855	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018231	MF-406
NREL/TP–					
410-5812	19:556	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018218	MF-270
411-5501	19:557	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000206	MF-270
411-5738	19:558	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018222	MF-270
411-5739	19:559	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018221	MF-271
413-5752	19:560	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018217	MF-273
413-5835	19:561	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000203	MF-273
413-5844	19:562	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000220	MF-270
430-5692	19:957	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018225	MF-249
430-5694	19:963	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018226	MF-249

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430-5700	19:958	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018227	MF-249
451-5733	19:563	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000204	MF-270
451-5755	19:564	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018213	MF-273
461-4857a	19:824	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000095	MF-233
463-4953	19:874	OSTI; NTIS; GPO Dep.	E 1.99:	DE93017080	MF-233
NUREG–					
0090-Vol.16-No.2	19:785	OSTI; NTIS; INIS; GPO		TI94001452	
0540-Vol.15-No.8	19:723	OSTI; NTIS; INIS; GPO		TI94002816	
0847-Suppl.12	19:786	OSTI; NTIS; INIS; GPO		TI94002517	
1363-Vol.5	19:724	OSTI; NTIS; INIS; GPO		TI94000791	
1400	19:1953	OSTI; NTIS; INIS; GPO		TI94000629	
1444	19:287	OSTI; NTIS; INIS; GPO		TI94001843	
1449	19:787	OSTI; NTIS; INIS; GPO		TI94000502	
1453	19:788	OSTI; NTIS; INIS; GPO		TI94000564	
1472	19:789	OSTI; NTIS; INIS; GPO		TI94001888	
NUREG/CP–					
0129	19:790	OSTI; NTIS; INIS; GPO		TI94001010	
0131	19:736	OSTI; NTIS; INIS; GPO		TI94002272	
0132	19:791	OSTI; NTIS; INIS; GPO		TI94001249	
NUREG/CR–					
2907-Vol.11	19:758	OSTI; NTIS; INIS		TI94001450	
4214-Rev.2-Pt.1	19:792	OSTI; NTIS; INIS; GPO		TI94001451	
4469-Vol.15	19:793	OSTI; NTIS; INIS; GPO		TI94001155	
4667-Vol.16	19:683	OSTI; NTIS; INIS; GPO		TI94000758	
5631-Rev.1-Add.1	19:2228	OSTI; NTIS; INIS; GPO		TI94002305	
5829	19:794	OSTI; NTIS; INIS; GPO		TI94000513	
5968	19:707	OSTI; NTIS; INIS; GPO		TI94001152	
5978	19:795	OSTI; NTIS; INIS; GPO		TI94001301	
5981	19:1035	OSTI; NTIS; INIS; GPO		TI94000617	
6022	19:796	OSTI; NTIS; INIS; GPO		TI94001302	
6043-Vol.1	19:737	OSTI; NTIS; INIS; GPO		TI94001006	
6071	19:708	OSTI; NTIS; INIS; GPO		TI94002342	
6085	19:1826	OSTI; NTIS; INIS; GPO		TI94000582	
6090	19:753	OSTI; NTIS; INIS; GPO		TI94000438	
6098	19:738	OSTI; NTIS; INIS; GPO		TI94002350	
6108	19:2076	OSTI; NTIS; INIS; GPO		TI94002300	
6113	19:2865	OSTI; NTIS; INIS; GPO		TI94002307	
NUREG/GR–					
0009	19:684	OSTI; NTIS; INIS		TI94001507	
NUREG/IA–					
0113	19:709	OSTI; NTIS; INIS; GPO		TI94000498	
NUTEK-EO–					
93-1	19:519	OSTI; NTIS		DE94709782	
NUTEK-NYEL–					
93-2	19:2610	OSTI; NTIS		DE94709783	
NUTEK-R–					
93-26	19:544	OSTI; NTIS; INIS		DE94709781	
NUTEK-VK–					
93-14	19:97	OSTI; NTIS		DE94709784	
93-15	19:1426	OSTI; NTIS		DE94709785	
NWPO-TR–					
015-90	19:288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041190	MF-814
020-93	19:289	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041148	MF-814
NYSERDA–					
93-11	19:909	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI94000503	
93-12	19:959	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI94000504	
ORNL–					
6757	19:2139	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001018	PC-408
6762	19:431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001998	MF-902
6771	19:979	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000529	MF-920
ORNL/CDIAC–					
34/R3	19:1954	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040597	MF-402
ORNL/CON–					
372	19:870	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001938	MF-220
ORNL/ER–					
143	19:2077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002751	MF-902
171-D1	19:227	*See* DOE/OR–01-1167-D1			

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180	19:432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001153	MF-902
ORNL/ER/Sub–					
87-99053/69	19:290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002537	MF-902
90-LJ068/1-D2	19:416	*See* DOE/OR–01-1168-D2			
ORNL/M–					
2591	19:415	*See* DOE/OR–01-1117/V1			
2990/Vol.1	19:252	*See* DOE/MWIP–3-Vol.1			
3070	19:2103	*See* Y/TS–1016			
ORNL/SUB–					
93-SL161	19:1835	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001118	
ORNL/Sub–					
86-SE793C	19:1099	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001012	MF-310
87-00184/04	19:1130	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001996	MF-114
88-SB775/03	19:1036	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040598	MF-114
91-SH641/1	19:2866	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001997	MF-350
ORNL/TM–					
11785	19:291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041041	MF-902
11824	19:292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000730	MF-902
12063	19:293	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001117	MF-902
12200	19:1037	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040814	MF-310
12220	19:797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001940	MF-400
12257	19:433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002244	MF-902
12259	19:434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002321	MF-402
12279	19:707	*See* NUREG/CR–5968			
12285	19:2867	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002184	MF-405
12296	19:739	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001036	MF-406
12368	19:435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000731	MF-902
12382	19:798	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001939	MF-400
12383	19:1813	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041043	MF-406
12403	19:1219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001780	MF-901
12404	19:2868	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040458	MF-405
12405	19:1846	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001801	
12406	19:708	*See* NUREG/CR–6071			
12413	19:736	*See* NUREG/CP–0131			
12419	19:2886	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001115	MF-400
12423	19:1100	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000978	
12424	19:2708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001017	PC-426
12426	19:2869	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040457	MF-405
12433	19:2229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041340	MF-402
12434	19:1847	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040593	
12452	19:1955	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002320	MF-406; MF-405
12478	19:1866	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001844	MF-403; MF-406
12493	19:553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002188	MF-902
OUP–					
93-13	19:2349	OSTI; NTIS; INIS		DE94606344	
93-14	19:2814	OSTI; NTIS; INIS		DE94606285	
93-15	19:1797	OSTI; NTIS; INIS		DE94606022	
PFC/IR–					
93-1	19:2615	*See* DOE/ET/51013–302			
PNL–					
5547	19:799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001005	MF-520
5691	19:800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000560	
5711-Vol.15	19:793	*See* NUREG/CR–4469-Vol.15			
6540	19:801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001002	MF-520
7445-Rev.1-Add.1	19:2228	*See* NUREG/CR–5631-Rev.1-Add.1			
7732	19:1131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000543	MF-721
7905	19:794	*See* NUREG/CR–5829			
8120	19:294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001097	MF-510
8388-Vol.2	19:295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000544	MF-721
8424-Vol.1	19:960	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000545	MF-350
8545-Vol.3	19:910	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000634	MF-350
8614-Vol.1	19:737	*See* NUREG/CR–6043-Vol.1			
8620	19:436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001999	MF-940
8661	19:911	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000579	MF-310
8714	19:296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001551	MF-901; MF-906
8731	19:2230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041253	MF-902
8741	19:297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001086	MF-902
8763	19:912	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001082	MF-350

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
8781	19:754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000546	MF-520
8782	19:298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001119	MF-721
8789	19:2112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000547	MF-902
8794	19:2242	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041156	
8795	19:913	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001083	MF-350
8797	19:385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000349	MF-902
8799-Pt.1	19:839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001354	MF-607
8807	19:2113	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000625	
8808	19:299	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000633	MF-940
8809-Vol.2	19:961	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041254	MF-350
8812	19:1956	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000903	MF-907
8815	19:2815	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040918	
8818	19:300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001080	MF-940
8820	19:1957	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001079	MF-607
8822	19:2114	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041324	
8823	19:2078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041137	MF-402
8828	19:2115	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001753	
8829	19:802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000499	
8838	19:860	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000724	MF-350
8839	19:301	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000587	MF-606
8847	19:302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002382	MF-940
8849	19:437	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001553	MF-600
8855	19:303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001120	MF-510
8863	19:304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000904	MF-940
8864	19:479	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002000	MF-701
8875	19:305	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002381	MF-902
8876	19:306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001552	MF-902
8878	19:2231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001078	MF-630
8881	19:914	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000905	MF-350
8886	19:307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002182	MF-902; MF-906
8908	19:308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001550	MF-630
8909	19:2232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002001	MF-607
8924	19:2870	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001846	
PNL-SA–					
20214	19:1038	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018786	MF-420
21755	19:2871	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018790	MF-505
22100	19:2233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019615	MF-507; MF-506
22123	19:2234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018789	MF-607
22414	19:1386	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018878	MF-905
22596	19:309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001670	MF-902
22748	19:310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001672	MF-512
22755	19:772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001669	MF-520
22765	19:2079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001674	MF-902
22959	19:840	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001666	MF-900
23021	19:841	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001668	MF-602
23102	19:2080	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001671	MF-902
23109	19:612	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001667	MF-261
PNWD–					
1980-12-HEDR	19:386	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000624	
POEF–					
3030	19:1909	*See* ES/ESH–37			
PPPL–					
2868	19:2709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000359	PC-420; PC-421; PC-426
2930	19:2710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000360	PC-420; PC-421; PC-426; PC-427
2935	19:2314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001719	PC-427
2938	19:2711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000361	PC-420; PC-427
2940	19:2712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001718	PC-420
2941	19:2713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001717	PC-420
2943	19:2714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001935	PC-420; PC-421; PC-427
PPPL-CFP–					
2959	19:2715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000511	MF-420

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2961	19:2716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000512	MF-421
2962	19:2717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001495	MF-414
2963	19:2778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001494	MF-420
2964	19:2718	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001497	MF-421
2965	19:2779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001496	MF-422
2971	19:2780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002231	MF-420
2973	19:2781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002233	MF-420
2975	19:2782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002235	MF-421
2976	19:2783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002236	MF-426
2981	19:2784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002241	MF-420
2985	19:2785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002224	MF-420
PPPL-Q–					
49	19:2786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000540	PC-400
PRRC–					
93-24	19:77	*See* DOE/MC/26031–12			
PSC–					
29	19:2719	OSTI; NTIS; INIS		DE94718912	
PSI-PROC–					
92-01	19:1303	OSTI; NTIS (US Sales Only); INIS		DE93612045	
QNPC–					
0001.	19:694	*See* CNIC–00680			
RAL–					
93-027	19:2416	OSTI; NTIS (US Sales Only); INIS		DE94604833	
93-040	19:2439	OSTI; NTIS (US Sales Only); INIS		DE94606504	
RERF-TR–					
10-91	19:2236	OSTI; NTIS; INIS		DE94718877	
7-92	19:2235	OSTI; NTIS; INIS		DE94718880	
RFP–					
4627	19:1039	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002268	PC-706
4726	19:438	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000516	MF-703
4727	19:1387	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018799	MF-700
4738	19:2116	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002927	PC-702
4746	19:387	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018802	MF-610
4763	19:1958	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000515	MF-603
4767	19:311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000996	MF-721
4775	19:439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000517	MF-721
4779	19:312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001769	MF-721
4783	19:1959	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001393	MF-603
4787	19:842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002306	MF-602
RL-SEP–					
866	19:440	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000751	MF-711
RT/AMB–					
90-30	19:525	*See* ENEA-RT-AMB–90-30			
92-07	19:1906	*See* ENEA-RT-AMB–92-07			
RT/ERG–					
93-09	19:1086	*See* ENEA-RT-ERG–93-09			
RT/ERG-NUC–					
93-10	19:1617	*See* ENEA-RT-ERG-NUC–93-10			
RT/INN–					
92-13	19:526	*See* ENEA-RT-INN–92-13			
92-14	19:1002	*See* ENEA-RT-INN–92-14			
92-39	19:1440	*See* ENEA-RT-INN–92-39			
92-42	19:2588	*See* ENEA-RT-INN–92-42			
92-46	19:1441	*See* ENEA-RT-INN–92-46			
92-48	19:2843	*See* ENEA-RT-INN–92-48			
RT/NUCL–					
92-27	19:2639	*See* ENEA-RT-NUCL–92-27			
92-28	19:2640	*See* ENEA-RT-NUCL–92-28			
92-38	19:2844	*See* ENEA-RT-NUCL–92-38			
RTI-INN–					
93-02	19:1528	*See* ENEA-RTI-INN–93-02			
SAIC–					
93041141	19:981	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041141	MF-700
SAND–					
90-1984	19:313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019777	MF-940
91-1818	19:1446	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001730	MF-700
92-0427	19:314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000548	MF-721
92-0700/4	19:315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001933	MF-902; MF-940
92-0700/5	19:316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001778	MF-940
92-1810	19:2273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000346	MF-814

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92-2013	19:317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001701	MF-940
92-2115C	19:1388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001204	MF-820
92-2165	19:803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000344	
92-2284	19:95	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001731	MF-126
92-2482C	19:1809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040757	MF-700
92-2532C	19:1798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040051	MF-707
92-2551C	19:2516	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040901	MF-704; MF-701
92-2587C	19:480	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040331	MF-706
92-2688	19:795	*See* NUREG/CR–5978			
92-2779C	19:1040	OSTI; NTIS; GPO Dep.	E 1.99:	DE93012847	MF-704
92-2932	19:441	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000549	MF-700
92-7277	19:318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001559	MF-721
92-7343	19:721	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000653	
92-7347	19:1436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001556	MF-721
93-0011	19:481	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000348	MF-700
93-0032	19:482	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000347	MF-706
93-0160C	19:814	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018841	MF-212
93-0188	19:815	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000350	MF-706
93-0205C	19:2872	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019408	MF-705
93-0337C	19:1447	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002036	MF-706
93-0438C	19:2873	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040058	MF-703; MF-706
93-0449C	19:1960	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040346	MF-706
93-0513C	19:1463	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001202	MF-706
93-0521C	19:951	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041143	MF-705
93-0547C	19:1132	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019820	MF-704
93-0610	19:1101	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000654	MF-704
93-0728C	19:508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000559	MF-712; MF-702
93-0816C	19:1448	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019417	MF-706
93-0887C	19:2564	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019066	MF-704
93-0922C	19:1389	OSTI; NTIS; GPO Dep.	E 1.99:	DE93011687	MF-706
93-0998C	19:1133	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041144	MF-704
93-1026C	19:2787	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041139	MF-700
93-1060C	19:2611	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001207	MF-706
93-1107C	19:1134	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001417	MF-701
93-1109C	19:319	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018826	MF-703
93-1127C	19:1449	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002293	MF-706
93-1197	19:320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000550	MF-940
93-1244C	19:442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001829	MF-902
93-1249C	19:2874	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018836	MF-705
93-1261C	19:443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002287	MF-703; MF-721
93-1287	19:1135	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001706	MF-704
93-1296C	19:1961	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001600	
93-1342	19:100	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000655	MF-132
93-1351	19:2315	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001557	MF-706
93-1375C	19:645	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002039	MF-261
93-1391	19:2565	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001679	MF-700
93-1400C	19:2566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040900	MF-700
93-1420C	19:1390	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040759	MF-706
93-1422-Vol.1	19:2567	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.	E 1.99:	DE94001703	MF-700
93-1422-Vol.2	19:2568	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.	E 1.99:	DE94001704	MF-700
93-1446C	19:2887	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001203	MF-700
93-1468C	19:1391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040753	MF-906; MF-706
93-1564C	19:1827	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019075	MF-706
93-1588	19:2612	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001151	MF-220
93-1617C	19:1220	OSTI; NTIS; GPO Dep.	E 1.99:	DE93017626	MF-706; MF-704
93-1626C	19:1450	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018850	MF-706
93-1648C	19:1041	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001567	MF-704
93-1673	19:1836	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002476	PC-700
93-1745C	19:740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041142	MF-504; MF-520
93-1750C	19:1451	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040897	MF-700

SAND–

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93-1770C	19:816	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018838	MF-212
93-1784C	19:1392	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019082	MF-700
93-1806C	19:2875	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019081	MF-705
93-1817C	19:817	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018840	MF-212
93-1835C	19:1393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019016	MF-906
93-1849C	19:818	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001209	MF-212
93-1856C	19:1136	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019077	MF-701
93-1866C	19:2876	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040752	MF-705
93-1874C	19:1452	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040332	MF-704; MF-706
93-1927C	19:2569	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041138	MF-706
93-1945C	19:2816	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040047	MF-700
93-1954C	19:1828	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000557	MF-706
93-1965C	19:1837	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001211	MF-705
93-1979C	19:1102	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040756	MF-700; MF-706
93-1981C	19:1453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040343	MF-700
93-1985	19:1394	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001168	MF-706
93-2012C	19:69	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040751	MF-126
93-2130C	19:2888	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040899	
93-2155C	19:1829	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040902	MF-700
93-2156	19:1867	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002611	MF-706
93-2182C	19:2720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001502	MF-712
93-2199	19:1868	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001165	PC-700
93-2213C	19:1437	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000555	MF-706
93-2214C	19:444	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000556	MF-702
93-2215C	19:445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000554	MF-702
93-2250C	19:321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001823	MF-902
93-2265C	19:1221	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001832	MF-706
93-2266C	19:322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002286	MF-902
93-2292C	19:2817	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001200	MF-700
93-7041	19:102	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001680	
93-7077C	19:2081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002042	MF-902; MF-903
93-7080C	19:747	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001420	MF-706
93-7084	19:579	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001558	MF-234
93-8012	19:446	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001167	MF-702
93-8220	19:1869	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002612	MF-700
94-8201	19:952	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001708	MF-706
SDC–					
91-00018	19:1604	*See* ANL-HEP-TR–91-26			
SEP-P–					
11-20	19:190	*See* SR/H–630			
SIB-SB–					
44	19:871	OSTI; NTIS		DE94709821	
SIB-TN–					
30	19:915	OSTI; NTIS		DE94709823	
33	19:1962	OSTI; NTIS		DE94709824	
SINPC–					
0002.	19:1613	*See* CNIC–00687			
SINRE–					
0035.	19:743	*See* CNIC–00657			
SIP–					
0050.	19:2618	*See* CNIC–00658			
0052.	19:2734	*See* CNIC–00660			
0053.	19:2619	*See* CNIC–00665			
SKB-TR–					
92-36	19:323	OSTI; NTIS; INIS		DE94606153	
92-38	19:324	OSTI; NTIS; INIS		DE94606154	
92-40	19:325	OSTI; NTIS; INIS		DE94606155	
92-42	19:326	OSTI; NTIS; INIS		DE94606156	
92-43	19:327	OSTI; NTIS; INIS		DE94606157	
92-44	19:728	OSTI; NTIS; INIS		DE94606173	
92-45	19:1042	OSTI; NTIS; INIS		DE94605305	
93-01	19:328	OSTI; NTIS; INIS		DE94606158	
93-02	19:329	OSTI; NTIS; INIS		DE94606159	
93-03	19:330	OSTI; NTIS; INIS		DE94606160	
93-04	19:331	OSTI; NTIS; INIS		DE94606161	
93-06	19:332	OSTI; NTIS; INIS		DE94606162	
SKI-TR–					
91-6/A	19:685	OSTI; NTIS; INIS		DE94605915	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
91-6/B	19:686	OSTI; NTIS; INIS		DE94605916	
93-18	19:333	OSTI; NTIS; INIS		DE94606163	
93-22	19:687	OSTI; NTIS; INIS		DE94605917	
93-25	19:334	OSTI; NTIS; INIS		DE94606164	
SLAC–					
411	19:1479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002929	PC-414
419	19:1551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002930	PC-414
SLAC-PUB–					
5298	19:2570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040937	MF-414
6010	19:2297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040939	MF-414
6080	19:1552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040944	MF-414
6085	19:1553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040945	MF-414
6102	19:1498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040951	MF-414
6103	19:1480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040952	MF-414
6108	19:1499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040957	MF-414
6109	19:2399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040958	MF-414
6118	19:1500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040965	MF-414
6145	19:1554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041051	MF-414
6149	19:1555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041053	MF-414
6150	19:1481	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041054	MF-414
6151	19:1556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041055	MF-414
6155	19:1557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041058	MF-414
6156	19:1482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041059	MF-414
6166	19:1558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041064	MF-414
6168	19:1559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041065	MF-414
6171	19:1501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041066	MF-414
6172	19:1560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041067	MF-414
6177	19:1561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041069	MF-414
6178	19:1562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041070	MF-414
6179	19:1502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041071	MF-414
6180	19:1563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041072	MF-414
6181	19:1564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041073	MF-414
6182	19:1565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041074	MF-414
6183	19:1483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041075	MF-414
6185	19:1484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041077	MF-414
6192	19:1485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041079	MF-414
6197	19:1596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041082	MF-414
6198	19:1566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041083	MF-414
6200	19:1503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040974	MF-414
6206	19:1567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040987	MF-414
6209	19:1568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040990	MF-414
6211	19:1569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040992	MF-414
6215	19:1504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040996	MF-414
6216	19:1597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040997	MF-414
6225	19:2400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041003	MF-414
6254	19:1598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041013	MF-414
6259	19:1599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041014	MF-414
6264	19:1467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041015	MF-414
6268	19:1570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041016	MF-414
6273	19:1571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041017	MF-414
6276	19:1799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041018	MF-414
6285	19:2401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041020	MF-414
6304	19:2368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041021	MF-414
6306	19:1572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041022	MF-414
6307	19:1573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041023	MF-414
6314	19:2402	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE93041025	MF-414
6315	19:1486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041084	MF-414
SLAC/SSRL–					
0022	19:1499	*See* SLAC-PUB–6108			
0025	19:1481	*See* SLAC-PUB–6150			
0028	19:1484	*See* SLAC-PUB–6185			
0042	19:1572	*See* SLAC-PUB–6306			
0043	19:1573	*See* SLAC-PUB–6307			
SLU-SKOMA-R–					
67	19:520	OSTI; NTIS		DE94709805	
SMC–					
0083.	19:1283	*See* CNIC–00661			
0084.	19:2190	*See* CNIC–00662			
0085.	19:2168	*See* CNIC–00674			
0086.	19:2170	*See* CNIC–00684			
0087.	19:1887	*See* CNIC–00686			

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SNV–					
4094	19:1963	OSTI; NTIS		DE94709796	
4155	19:843	OSTI; NTIS		DE94709797	
4157	19:534	OSTI; NTIS		DE94709798	
4158	19:535	OSTI; NTIS		DE94709799	
4173	19:844	OSTI; NTIS		DE94709800	
4178	19:1964	OSTI; NTIS		DE94709801	
4186	19:867	OSTI; NTIS		DE94709802	
SOL–					
93-6	19:2877	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001160	MF-405
SR–					
93-R-5278-115	19:648	*See* DOE/MC/23166–3414			
SR/H–					
584	19:1438	*See* CONF-740807–1			
622	19:228	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000605	MF-706
623	19:335	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000606	MF-706
624	19:447	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000607	MF-700
625	19:185	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000608	MF-700
626	19:186	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000609	MF-700
627	19:187	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000610	MF-700
628	19:188	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000611	MF-700
629	19:189	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000528	
630	19:190	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001019	MF-700
631	19:191	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001020	MF-700
632	19:192	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001021	MF-700
633	19:193	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001022	MF-700
634	19:194	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001023	MF-706
635	19:195	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001024	MF-706
637	19:336	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001026	MF-721
638	19:196	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001027	MF-700
639	19:197	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001028	MF-700
640	19:198	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001029	MF-700
641	19:199	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001030	MF-700
642	19:200	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001031	MF-706
644	19:337	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001985	MF-721
645	19:338	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001986	MF-706
646	19:201	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001987	MF-700
647	19:202	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001988	MF-700
648	19:203	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001989	MF-700
649	19:229	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001990	MF-706
650	19:1395	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001991	MF-706
651	19:204	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001887	MF-700
652	19:1043	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002220	MF-700
653	19:1044	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002249	MF-700
654	19:205	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002250	MF-700
655	19:222	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002251	MF-706
656	19:1045	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002252	MF-706
657	19:1046	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002253	MF-706
658	19:1047	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002254	MF-700
659	19:1048	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002255	MF-706
660	19:1049	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002256	MF-700
661	19:1050	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002257	MF-706
SSCL–					
644	19:1574	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001775	PC-400
646	19:1575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001776	PC-414
647	19:1505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001774	PC-414
SSCL-Preprint–					
470	19:1487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018757	MF-414
486	19:1576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019822	MF-414
499	19:1577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001093	MF-414
505	19:1488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001095	MF-400; MF-414
511	19:1506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001096	MF-414
STF–					
19A93007	19:2582	OSTI; NTIS; INIS		DE94606854	
STUK-A–					
103	19:2117	OSTI; NTIS; INIS		DE94605489	
107	19:2237	OSTI; NTIS; INIS		DE94605626	
111	19:2159	OSTI; NTIS; INIS		DE94605709	
STUK-B-YTO–					
103	19:688	OSTI; NTIS; INIS		DE94605918	

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109	19:689	OSTI; NTIS; INIS		DE94605919	
SVF–					
468	19:60	OSTI; NTIS		DE94709786	
469	19:540	OSTI; NTIS		DE94709787	
470	19:1965	OSTI; NTIS		DE94709788	
471	19:1966	OSTI; NTIS		DE94709789	
473	19:2118	OSTI; NTIS		DE94709790	
475	19:161	OSTI; NTIS		DE94709791	
TAC–					
13	19:339	OSTI; Dr. L. W. Schemilt, General Sciences Building, Room 216, McMaster University, Hamilton, Ontario L8S 4K1		TI94001362	
TD–					
2695	19:2242	*See* PNL–8794			
TKK-NEMO–					
12	19:578	OSTI; NTIS		DE94709703	
TR-D/M–					
21.	19:249	*See* DOE-HMIP-RR–92.057			
TRI-PP–					
93-68	19:2383	*See* FNAL/C–93/197			
TRITA-EEA–					
9302	19:812	OSTI; NTIS; INIS		DE94709806	
TSHUNE–					
0046.	19:729	*See* CNIC–00652			
0048.	19:733	*See* CNIC–00667			
0049.	19:712	*See* CNIC–00668			
0051.	19:1417	*See* CNIC–00671			
0052.	19:171	*See* CNIC–00672			
0053.	19:1284	*See* CNIC–00673			
0054.	19:1418	*See* CNIC–00676			
0057.	19:730	*See* CNIC–00697			
TVA–					
93040417	19:2119	OSTI; NTIS		DE93040417	
TVA/WM–					
93/15	19:2120	OSTI; NTIS		DE93040573	
93/21	19:2121	OSTI; NTIS		DE93040576	
TVA/WR–					
92/20	19:2122	OSTI; NTIS		DE93040423	
UCB-PTH–					
93/04	19:2414	*See* LBL–33677			
UCB/ERL-M–					
92/145	19:2721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001307	MF-421
92/146	19:1396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001306	MF-421
92/147	19:2722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001304	MF-427
92/148	19:2723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001305	MF-427
UCRL-CR–					
114189	19:1103	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001520	MF-904
115002	19:2878	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001771	MF-705
115020	19:2879	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041116	MF-907
115021	19:2316	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041115	MF-907
115408	19:483	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001637	MF-700
115409	19:2880	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94001612	MF-700
UCRL-ID–					
111979	19:340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041100	MF-814
112432	19:341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001854	MF-814
112771	19:2317	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003014	MF-706
112774	19:1137	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003017	MF-706
112834	19:342	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE93040441	MF-814
112900	19:753	*See* NUREG/CR–6090			
113760-Rev.1	19:2160	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001707	MF-700
113831	19:2527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000951	MF-704
113833	19:1800	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000952	MF-706
114107	19:1885	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040440	MF-702
114158	19:2082	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000352	MF-702
114164	19:1967	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000353	MF-700
114590	19:1051	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001852	MF-704
114672	19:1801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000955	MF-420
114696	19:2724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001856	MF-422
114706	19:1052	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000954	MF-704
114774	19:343	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001859	MF-700
114807	19:2889	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001545	MF-705

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UCRL-ID–					
114812	19:1838	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000957	MF-705
114904	19:1830	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002614	MF-706
114915	19:2318	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019879	MF-910
114972	19:1370	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000408	MF-700
115041	19:1968	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001857	MF-700
115111	19:804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000553	
115112	19:1802	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001853	MF-706
115135	19:1870	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001858	MF-706
115267	19:808	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001547	MF-700
UCRL-JC–					
104909	19:984	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000310	MF-703
107192	19:1848	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040846	MF-900
108648-Rev.1	19:2881	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001039	MF-705
108983	19:1803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040541	MF-700
109494	19:2544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001040	MF-700
109597	19:2882	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000398	MF-706
110327	19:2083	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000304	MF-902
110366	19:2883	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001418	MF-700
110367	19:1454	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001516	MF-700
111288	19:1222	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040547	MF-704
111337	19:1849	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000386	MF-700
111342	19:1850	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001524	MF-741
111343	19:1851	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001523	MF-700
111445	19:2788	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001067	MF-712
111732	19:2890	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040487	MF-900; MF-902
111897	19:1852	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041349	MF-900
111960	19:1138	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000404	MF-700
111969-Rev.1	19:1139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040546	MF-504
112023	19:1455	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040535	MF-700
112045	19:1104	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000307	MF-704
112054	19:1053	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001045	MF-404
112108	19:1105	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041320	MF-704
112168	19:2517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000306	MF-700
112273	19:1969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040490	MF-401; MF-402
112339	19:1456	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040853	MF-706
112347-Rev.1	19:1054	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019947	MF-704
112349	19:2319	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001057	MF-700
112553	19:1457	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019629	MF-906
112554	19:2545	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019624	MF-900
112596	19:1427	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019605	MF-905
112636	19:1881	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000399	MF-706
112637	19:1882	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000402	MF-706
112638	19:1397	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000401	MF-706
112639	19:1883	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000400	MF-706
112683	19:1839	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019625	MF-704
112742	19:2789	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019623	MF-706
112763	19:1055	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040483	MF-904
112765	19:2790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001536	MF-700
112769	19:484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001526	MF-705
112793	19:2583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000387	MF-704
112821	19:206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041108	MF-801; MF-814
112888	19:485	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000390	MF-700
112925	19:2518	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040213	MF-700
113091	19:2791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040540	MF-712
113194	19:1970	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040850	MF-906
113252	19:1853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040538	MF-700
113254	19:2584	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040537	MF-706
113294	19:2320	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041348	MF-700
113299	19:1106	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001048	MF-703
113300	19:1056	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001056	MF-703
113378	19:1107	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001543	MF-904
113394	19:1854	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041346	MF-901
113400	19:1855	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001050	MF-700
113403	19:1140	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001049	MF-701
113406	19:2274	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001058	MF-703
113413	19:1069	*See* ANL/ET/CP–79207			
113437	19:1398	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040549	MF-706
113475	19:1804	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019377	MF-906

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
113483	19:1458	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000397	MF-706
113499	19:1884	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040548	MF-706
113505	19:2792	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000384	MF-712
113549	19:2546	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001046	MF-901
113621	19:1871	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018633	MF-700
113691	19:2891	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000301	MF-700
113741	19:1805	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018645	MF-906
113748	19:344	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019152	MF-706
113773	19:448	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040499	MF-903
113778	19:1057	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000303	MF-704
113779	19:1058	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001066	MF-404
113790	19:449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002006	MF-902
113794	19:1141	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019938	MF-904
113795	19:1059	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019942	MF-904
113802	19:1060	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040856	MF-704
113803	19:2275	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000305	MF-403
113806	19:1142	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040209	MF-403
113810	19:1061	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000393	MF-704
113895	19:2321	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019576	MF-705
114003	19:1459	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001608	MF-706
114028	19:1971	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001041	MF-707
114043	19:2793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001062	MF-712
114065	19:1840	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001063	
114072	19:2547	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019941	MF-706
114074	19:1460	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019916	MF-712
114095	19:2322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040851	MF-910
114109	19:1856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000396	MF-701
114114	19:1062	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000389	MF-704
114119	19:603	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000388	MF-251
114139	19:1223	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002015	MF-700
114157	19:1063	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001068	MF-904
114161	19:1256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001043	MF-404
114175	19:2084	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040495	MF-901
114185	19:2794	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001515	MF-705
114192	19:1143	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001528	MF-904
114201	19:1857	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001047	MF-741
114238	19:2795	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002008	MF-900
114285	19:2585	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019506	MF-706
114311	19:2323	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001059	MF-700
114331	19:1428	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041347	MF-705
114340	19:2556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040485	MF-411
114360	19:2884	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040486	MF-405
114363	19:2324	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000309	MF-705
114367	19:2534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001055	MF-700
114402	19:982	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019612	MF-700
114438	19:1814	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019621	MF-412
114445	19:1806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93018653	MF-900
114493	19:1461	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019940	MF-706
114562	19:1399	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019630	MF-706
114577	19:1858	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001768	
114643	19:971	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001533	MF-900
114679	19:2796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001535	MF-700
114680-VGS	19:805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001537	MF-700
114695	19:2725	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001604	MF-420
114718	19:2586	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000405	MF-700
114779	19:1064	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001044	MF-704
114803	19:2726	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040849	MF-900
114852	19:975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019622	MF-402
114857	19:2535	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019950	MF-705
114864	19:177	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000308	MF-506; MF-517
114927	19:976	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019574	MF-400
114934	19:2325	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019606	MF-902
114976	19:953	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019611	MF-402
114996	19:819	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019620	MF-906
115005	19:2085	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001772	MF-902
115013	19:2276	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000406	MF-412
115113	19:2277	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040551	MF-703
115147	19:1462	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000403	MF-700
115169	19:1400	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002027	MF-706
115215	19:1831	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040845	MF-906

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
UCRL-JC–					
115232	19:1401	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001767	MF-900
115270	19:1872	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001766	MF-731
115418	19:2326	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001661	MF-900
UCRL-LR–					
105821-93-3	19:2797	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002602	PC-712
108991-Add.1	19:450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040484	MF-707
112400-92-1	19:451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041099	PC-402
114070-2	19:983	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000950	PC-700
114182	19:1144	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019878	PC-403
114660	19:2798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040534	MF-426
UNI–					
138	19:773	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040694	MF-520
UNIT-F–					
1992-8	19:2351	OSTI; NTIS; INIS		DE94606332	
1992-15	19:2561	OSTI; NTIS; INIS		DE94606753	
USGS-OFR–					
93-551-D	19:2255	*See* DOE/OR/22089–2			
UTNL-R–					
0298	19:2818	OSTI; NTIS; INIS		DE94719026	
0300	19:2819	OSTI; NTIS; INIS		DE94719025	
UW-CPTC–					
93-5	19:2727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000989	MF-426
VTT-EKA-B–					
9	19:2820	OSTI; NTIS; INIS		DE94606286	
VTT-SYMP–					
112	19:962	OSTI; NTIS		DE94709701	
VTT-TIED–					
1396	19:677	OSTI; NTIS; INIS		DE94605905	
1446	19:678	OSTI; NTIS; INIS		DE94605906	
WAPD-RC/E(EE)–					
2838	19:2086	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001995	MF-506
WAPD-T–					
2931	19:741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002346	MF-506; MF-523
2941	19:1224	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001762	MF-501
2942	19:660	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002344	MF-506
2943	19:661	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002343	MF-500
2953	19:2528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002521	MF-520
2954	19:2529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001761	MF-506
2958	19:710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001902	MF-523
2967	19:711	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001906	MF-506
2984	19:1429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002345	MF-506
2991	19:1065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000519	MF-504
3004	19:1066	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001754	MF-506
WHC-EP–					
0182-63	19:345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002426	MF-940
0393-Rev.3-Pt.1	19:346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001236	MF-940
0393-Rev.3-Pt.2	19:347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001237	MF-940
0619-Vol.3	19:452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001230	MF-940
0643-Rev.1	19:348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002354	MF-940
0679	19:2087	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001228	MF-902
0682	19:845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001156	MF-907
0684	19:453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001238	MF-902
0688	19:454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001225	MF-902
WHC-MR–					
0270	19:455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002477	MF-902
0425	19:1402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001239	MF-940
0433	19:349	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002413	MF-940
WHC-SA–					
1714	19:1403	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041111	MF-500
1764	19:2278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002483	MF-903
1792	19:388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001698	MF-902
1797-Rev.1	19:846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002199	MF-940
1799	19:350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040408	MF-902
1811	19:351	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040313	MF-940
1821	19:223	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE93040382	MF-940
1881	19:352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040405	MF-940
1935	19:353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001194	MF-902
1939	19:1890	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001227	MF-902
1941	19:2088	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002409	MF-940
1975	19:354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93019121	MF-500

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
1997	19:456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040370	MF-902
2018	19:457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040409	MF-906
2021	19:230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001681	MF-940
2025	19:355	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001173	MF-906
2026	19:356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001180	MF-902
2055	19:357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001691	MF-902; MF-940
2056	19:458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001690	MF-902
2057	19:459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001696	MF-902
2058	19:460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001689	MF-902
2061	19:461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001687	MF-902
2062	19:358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001686	MF-902
2064	19:2089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001693	MF-902
2078	19:359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000736	MF-902
2087	19:231	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002410	MF-904
2108	19:360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002319	MF-902
WHC-SD-EN-AP–					
134	19:462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040403	MF-902
140	19:463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002478	MF-630
145	19:2090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041106	MF-902
147	19:2091	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041113	MF-630
WHC-SD-EN-RPT–					
005	19:1816	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002493	MF-630
WHC-SD-EN-SD–					
001	19:389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002494	MF-510; MF-702; MF-705; MF-721
WHC-SD-EN-TI–					
164	19:2092	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041109	MF-903
181	19:464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041107	MF-902
195	19:361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001685	MF-903
198	19:2093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000738	MF-902
202	19:465	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001700	MF-630
WHC-SD-EN-TP–					
035	19:466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001697	MF-630
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006	19:362	OSTI; NTIS; GPO Dep.	E 1.99:	DE93041341	MF-606
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006	19:363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001007	MF-902
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1127	19:1225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000722	MF-940
1130	19:364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000720	MF-940
1131	19:224	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000719	MF-900
1132	19:365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000718	MF-940
1133	19:366	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000717	MF-940
1134	19:467	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000716	MF-906
1136	19:367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000713	MF-940
11933	19:368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000936	MF-940
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93-010	19:1067	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001196	MF-706
93-039	19:2094	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001809	MF-702
93-158	19:2095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001181	MF-702; MF-706
93-169	19:1257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041121	MF-701
93-224	19:469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001186	MF-702
93-284	19:371	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93040910	MF-702
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DE93040883	ANL/CMB/PP-80296
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DE93040887	ANL/CHM/PP-77001
DE93040889	ANL/BIM/PP-78894
DE93040890	ANL/BIM/PP-72224
DE93040893	ANL/BIM/PP-77489
DE93040895	ANL/CMT/PP-75527
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DE93040974	SLAC-PUB-6200

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DE93040977	ANL/MSD/PP–75442
DE93040980	HW–48325
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DE93041049	CONF-9301129–1
DE93041050	CONF-930907–12
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DE93041084	SLAC-PUB–6315
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DE93041127	IS-M–753
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DE93041142	SAND–93-1745C
DE93041143	SAND–93-0521C
DE93041144	SAND–93-0998C
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DE93041148	NWPO-TR–020-93
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DE93041165	ANL/ER/CP–80457
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DE93041169	ANL/MSD/CP–80681
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DE93041175	ANL/RE/CP–78893
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DE93041178	ANL/MCT/CP–77517
DE93041179	ANL/PHY/CP–78785
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DE93041183	ANL/FC/CP–78840
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DE93041187	ANL/CMT/CP–80587
DE93041188	ANL/RE/CP–80533
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DE93041252	EGG–2712
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DE93041254	PNL–8809-Vol.2
DE93041280	DOE/ER/61442–1
DE93041281	DOE/ER/61420–1
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DE93041324	PNL–8822
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DE93041341	WHC-SD-HWV-TRP–006
DE93041343	ANL/ECT/CP–80138
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DE93041347	UCRL-JC–114331
DE93041348	UCRL-JC–113294
DE93041349	UCRL-JC–111897
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DE93608801	INIS-mf–13387
DE93609511	JINR–7-46-90
DE93609886	INIS-SU–321/A
DE93612045	PSI-PROC–92-01
DE93612972	INIS-mf–13388
DE93614568	LRP–462/92
DE93615286	INIS-SU–327/A
DE93616001	INIS-mf–13442
DE93616535	JINR–1-47-91
DE93616653	INIS-SU–338
DE93619992	IPPCZ–321
DE93620498	INIS-SU–342/A
DE93620575	INIS-SU–340/A
DE93620974	INIS-SU–341/A
DE93623250	INIS-mf–13516
DE93623464	KIYal–92-12
DE93624533	INIS-mf–13522
DE93626131	INIS-RU–343
DE93626358	JINR–5-51-91
DE93796949	INIS-mf–14150
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DE94000017	DOE/NBM–94000017
DE94000203	NREL/TP–413-5835
DE94000204	NREL/TP–451-5733
DE94000206	NREL/TP–411-5501
DE94000220	NREL/TP–413-5844
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DE94000303	UCRL-JC–113778
DE94000304	UCRL-JC–110327
DE94000305	UCRL-JC–113803
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DE94000307	UCRL-JC–112045
DE94000308	UCRL-JC–114864
DE94000309	UCRL-JC–114363
DE94000310	UCRL-JC–104909
DE94000317	CONF-880540–4
DE94000318	CONF-8804338–1
DE94000319	CONF-9106442–1
DE94000321	CONF-8912178–1
DE94000322	CONF-9104425–1
DE94000323	CONF-901221–2
DE94000324	CONF-900874–5
DE94000325	CONF-900992–3
DE94000328	CONF-931115–12
DE94000330	CONF-9308122–8
DE94000331	CONF-9309199–5
DE94000332	CONF-930749–73
DE94000335	CONF-9308122–6
DE94000336	CONF-9305285–1
DE94000338	CONF-9308150–5
DE94000339	CONF-9310102–21
DE94000340	CONF-9308176–1
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DE94000346	SAND–92-1810
DE94000347	SAND–93-0032
DE94000348	SAND–93-0011
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DE94000353	UCRL-ID–114164
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DE94000374	CONF-9308122–9
DE94000375	CONF-930720–20
DE94000376	CONF-930796–4
DE94000384	UCRL-JC–113505
DE94000386	UCRL-JC–111337
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DE94000388	UCRL-JC–114119
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DE94000402	UCRL-JC–112637
DE94000403	UCRL-JC–115147
DE94000404	UCRL-JC–111960
DE94000405	UCRL-JC–114718

Order No.	Report No.
DE94000406	UCRL-JC-115013
DE94000408	UCRL-ID-114972
DE94000422	HW-61570-Del.
DE94000423	HW-64450
DE94000424	DOE/OR-01-1167-D1
DE94000425	DOE-TSL-1-93-Rev.1
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DE94000431	DOE/FE/62046-H1
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DE94000444	ANL/CMT/CP-79275
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DE94000446	ANL-HEP-TR-93-73
DE94000462	ANL/EAIS/CP-80792
DE94000464	ANL/ET/CP-79207
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DE94000466	ANL/ET/CP-80756
DE94000468	ANL/EAIS/CP-80710
DE94000469	ANL/PHY/CP-79186
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DE94000473	CONF-930907-13
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DE94000487	CONF-931160-18
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DE94000517	RFP-4775
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DE94000529	ORNL-6771
DE94000530	IR-CR-93078
DE94000531	NIPER-717
DE94000540	PPPL-Q-49
DE94000541	ANL-93/26
DE94000542	LA-12586-PR
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DE94000545	PNL-8424-Vol.1
DE94000546	PNL-8781
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DE94000559	SAND-93-0728C
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DE94000592	FNAL/C-93/197
DE94000593	FNAL/C-93/227
DE94000597	FNAL/C-93/252-E
DE94000599	KY/ER-11
DE94000601	ES/ER/TM-36
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DE94000611	SR/H-628
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DE94000619	FNAL/C-93/229
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DE94000632	ANL/EAIS/TM-103
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DE94000653	SAND-92-7343
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DE94000746	DOE/CE/90052--T1
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DE94000788	DOE/RL-92-70-Vol.1
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DE94000854	DOE/OR/21607-2
DE94000859	DOE/OR/21607-T6
DE94000861	DOE/OR/21607-T7
DE94000871	DOE/ER/13537-T6
DE94000872	DOE/MC/26018-3439

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DE94000873	DOE/MC/26018–3438
DE94000875	DOE/ER/14079–27
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DE94000884	LA-UR–93-3426
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DE94000949	DOE/BP/21985–7
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DE94000955	UCRL-ID–114672
DE94000957	UCRL-ID–114812
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DE94000971	DOE/ER/14121–2
DE94000974	DOE/CE/23821–T2
DE94000975	DOE/BP/25174–3
DE94000977	DOE/BP/25174–6
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DE94001225	WHC-EP–0688
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DE94001228	WHC-EP–0679
DE94001230	WHC-EP–0619-Vol.3
DE94001231	DOE/ET/53088–602
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DE94001234	DOE/ET/53088–623
DE94001235	DOE/ET/53088–626
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DE94001237	WHC-EP–0393-Rev.3-Pt.2
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DE94001279	ANL/ES/CP–79268
DE94001280	ANL/CHM/CP–79022

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DE94001287	ANL/XFD/CP–80255
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DE94001341	ANL/RE/CP–78949
DE94001342	ANL/EP/CP–80799
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DE94001445	DOE/SF/18852–T31
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DE94001575	DOE/ER/53198–224
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DE94001588	DOE/ER/13958–43
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DE94001653	DOE/ER/13795–T1
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DE94001687	WHC-SA–2061
DE94001689	WHC-SA–2058
DE94001690	WHC-SA–2056
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DE94001693	WHC-SA–2064
DE94001695	DOE/RL–93-64
DE94001696	WHC-SA–2057
DE94001697	WHC-SD-EN-TP–035
DE94001698	WHC-SA–1792
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DE94001702	DOE/RL–93-48
DE94001703	SAND–93-1422-Vol.1
DE94001704	SAND–93-1422-Vol.2
DE94001706	SAND–93-1287
DE94001707	UCRL-ID–113760-Rev.1
DE94001708	SAND–94-8201
DE94001711	DOE/NASA–1087-2

Order No.	Report No.
DE94001713	DOE/EH–0346
DE94001714	CONF-930484–
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DE94001738	DOE/ER/45076–3
DE94001744	DOE/BC/14954–2
DE94001745	DOE/BC/14474–15
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DE94001747	DOE/BC/14956–2
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DE94001798	DOE/ER/13790–5
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DE94001841	DOE/EIA–0538(93/94-2)
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DE94001848	ES/ESH–31/V2
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DE94001851	LA–12169-MS
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DE94001906	WAPD-T–2967
DE94001908	DOE/ER/00881–T4
DE94001918	DOE/MC/27394–94/C0263
DE94001920	DOE/MC/28065–94/C0249
DE94001924	DOE/ER/81186–94/C0265
DE94001933	SAND–92-0700/4
DE94001934	ANL–93/23
DE94001935	PPPL–2943
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DE94001937	ES/ESH–36
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DE94001946	Y/DV–1276
DE94001947	Y/DD–613
DE94001948	Y/LF–456/R1
DE94001949	Y/DV–1268
DE94001950	DOE/OR–01-1115-D2
DE94001954	DOE/PC/89785–13
DE94001966	DOE/PC/91309–T9
DE94001974	DOE/PC/79672–T7
DE94001985	SR/H–644
DE94001986	SR/H–645
DE94001987	SR/H–646
DE94001988	SR/H–647
DE94001989	SR/H–648
DE94001990	SR/H–649
DE94001991	SR/H–650
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DE94001996	ORNL/Sub–87-00184/04
DE94001997	ORNL/Sub–91-SH641/1
DE94001998	ORNL–6762
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DE94002001	PNL–8909
DE94002006	UCRL-JC–113790
DE94002008	UCRL-JC–114238
DE94002015	UCRL-JC–114139
DE94002019	LA–12653-PR
DE94002020	LA–12682-PR
DE94002027	UCRL-JC–115169
DE94002029	WSRC-RP–92-824-Rev.1
DE94002031	WSRC-TR–92-100-10
DE94002036	SAND–93-0337C
DE94002039	SAND–93-1375C
DE94002042	SAND–93-7077C
DE94002044	WSRC-MS–93-286
DE94002048	WSRC-TR–93-093
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DE94002157	DOE/PC/90046–T1
DE94002162	ANL/PHY/CP–81005
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DE94002179	DOE/PC/90310–T12
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DE94002190	CONF-9310145–2
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DE94002196	CONF-9310205–1
DE94002197	CONF-9106235–7
DE94002199	WHC-SA–1797-Rev.1
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DE94002299	ANL/MCS-TM–181
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DE94002345	WAPD-T–2984
DE94002346	WAPD-T–2931
DE94002347	ANL/ET/CP–78614
DE94002354	WHC-EP–0643-Rev.1
DE94002362	ANL/CMT/CP–80775
DE94002364	ANL/APS/IN/VIB–93/8
DE94002365	ANL/CMT/CP–79185
DE94002368	ANL/ASD/CP–80971
DE94002372	ANL/RA/CP–79576
DE94002375	ANL/ET/CP–81036
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DE94002408	ANL/NPR–93/002	DE94604022	INIS-BR–3174	DE94604519	CEA-CONF–11371
DE94002409	WHC-SA–1941	DE94604023	INIS-BR–3177	DE94604520	CEA-CONF–11373
DE94002410	WHC-SA–2087	DE94604024	INIS-BR–3178	DE94604521	CEA-CONF–11374
DE94002413	WHC-MR–0433	DE94604025	INIS-BR–3179	DE94604532	CNIC–00671
DE94002426	WHC-EP–0182-63	DE94604026	INIS-BR–3180	DE94604533	CNIC–00676
DE94002433	FNAL-TM–1851	DE94604027	INIS-BR–3181	DE94604534	INIS-mf–13723
DE94002434	LA–12627-MS	DE94604028	INIS-BR–3182	DE94604539	CEA-CONF–11505
DE94002436	CONF-9310102–32	DE94604029	INIS-BR–3184	DE94604543	CNIC–00646
DE94002439	CONF-930722–50	DE94604030	INIS-BR–3188	DE94604544	CNIC–00647
DE94002444	CONF-931095–44	DE94604031	INIS-BR–3190	DE94604545	INIS-UA–0001
DE94002452	CONF-9210121–8	DE94604032	INIS-BR–3191	DE94604559	DL/SCI/TM–94E
DE94002456	CONF-930403–54	DE94604033	INIS-BR–3192	DE94604564	BARC–1993/E/014
DE94002459	CONF-930711–4	DE94604034	INIS-BR–3193	DE94604568	CNIC–00667
DE94002476	SAND–93-1673	DE94604035	INIS-BR–3194	DE94604578	CNIC–00677
DE94002477	WHC-MR–0270	DE94604036	INIS-BR–3195	DE94604584	INIS-mf–13713
DE94002478	WHC-SD-EN-AP–140	DE94604037	INIS-BR–3196	DE94604586	CEA-CONF–11464
DE94002483	WHC-SA–1764	DE94604038	INIS-BR–3197	DE94604587	CEA-CONF–11504
DE94002490	CONF-931079–6	DE94604039	INIS-BR–3198	DE94604588	CNIC–00680
DE94002493	WHC-SD-EN-RPT–005	DE94604040	INIS-BR–3199	DE94604593	CNIC–00668
DE94002494	WHC-SD-EN-SD–001	DE94604041	INIS-BR–3200	DE94604602	CNIC–00652
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DE94002499	LA–12650-MS	DE94604074	BARC–1993/P/003	DE94604640	BARC–1993/E/010
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DE94002521	WAPD-T–2953	DE94604076	INIS-BR–3153	DE94604653	CEA-CONF–11512
DE94002530	WSRC-TR–92-554-Rev.1	DE94604077	INIS-BR–3167	DE94604654	CNIC–00644
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DE94002538	Y/TS–1016	DE94604079	INIS-BR–3169	DE94604665	DOE-HMIP-RR–92.12
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DE94002556	FEMP–2307	DE94604096	CNIC–00632	DE94604691	INIS-mf–13729
DE94002557	FEMP/SUB–064	DE94604121	BARC–1992/E/045	DE94604693	INIS-mf–13727
DE94002565	LA-SUB–93-311	DE94604132	CEA-CONF–11422	DE94604694	INIS-mf–13728
DE94002567	LA-SUB–93-236	DE94604133	CNIC–00673	DE94604703	INIS-GB–501
DE94002570	LA-SUB–93-299	DE94604134	CNIC–00683	DE94604704	INIS-GB–502
DE94002583	Y/SUB–92-YP507C/3/P1	DE94604136	CNIC–00627	DE94604705	INIS-GB–504
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DE94002631	LA-UR–93-3532	DE94604173	CNIC–00648	DE94604986	INIS-mf–13724
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DE94002724	LA-UR–93-3800	DE94604291	INIS-BR–3183	DE94605096	JINR-E–14-92-184
DE94002751	ORNL/ER–143	DE94604292	INIS-BR–3186	DE94605138	INIS-mf–13718
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DE94002841	EGG-WTD–10660	DE94604332	CEA-CONF–11519	DE94605305	SKB-TR–92-45
DE94002860	EGG-MS–10781	DE94604340	INIS-mf–13720	DE94605318	INIS-mf–13725
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DE94002881	EGG-WTD–10813	DE94604365	CNIC–00662	DE94605430	LUFTD2-TFFF–0038-1-155
DE94002883	EGG-ERD–10453	DE94604384	CNIC–00669	DE94605451	GTK-TUTK–98
DE94002897	EGG–2678(92)	DE94604390	CNIC–00636	DE94605452	GTK-YST–82
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DE94002930	SLAC–419	DE94604393	INIS-mf–13719	DE94605485	YJT–93-08
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DE94602763	IAEA-TECDOC–713	DE94604429	CNIC–00684	DE94605501	YJT–92-27
DE94603246	IAEA-TECDOC–716	DE94604431	CNIC–00688	DE94605502	YJT–93-09
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DE94603559	INIS-mf–13632	DE94604433	CEA-CONF–11503	DE94605504	YJT–93-11
DE94603958	INIS-mf–13584	DE94604434	CEA-CONF–11522	DE94605591	INIS-BR–3172

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DE94605843	JINR-R–11-92-509
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DE94605906	VTT-TIED–1446
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DE94605916	SKI-TR–91-6/B
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